AN EXAMINATION OF COGNITIVE APPRAISALS AND COPING ON ACADEMIC TASKS: A TEST OF LAZARUS' STRESS AND COPING MODEL

BY

BARRY BERTRAND BENNESS, M.A.Sc.

A Thesis

Submitted to the School of Graduate Studies

in Partial Fulfilment of the Requirements

for the Degree

Doctor of Philosophy

McMaster University

September 1989

COGNITIVE APPRAISALS AND COPING ON ACADEMIC TASKS

DOCTOR OF PHILOSOPHY (1989) McMASTER UNIVERSITY
(Psychology) Hamilton, Ontario

Title: An Examination of Cognitive Appraisals and Coping on Academic Tasks: A Test of Lazarus' Stress and Coping Model

AUTHOR: Barry Bertrand Benness, B.A. (University of Guelph)
M.A.Sc. (University of Waterloo)

SUPERVISOR: Professor Richard B. Day

NUMBER OF PAGES: xii, 283

ABSTRACT

Lazarus' stress and coping theory was evaluated in the context of academic tests and exams. In keeping with the recommendations of Lazarus and Folkman (1984) to use both laboratory and naturalistic settings and ipsative-normative designs, three experiments were conducted. Experiment 1 examined the cognitive appraisals, emotions, coping, and performance of 180 university students during a simulated math test. Experiment 2 compared the primary appraisals (stress, threat, and challenge) and coping of 100 university students on the simulated math tests with those of the same students on university exams. Finally, Experiment 3 compared the cognitive appraisals, emotions, coping, and performance of 46 university students on an in-class review test with those of the same students on other in-class tests.

A test is a time-limited transaction between a person and a stressful event. The objective demands of the task are identical for all and these objective task variables can be controlled and altered. Conversely, the factors that each person bring to the test are different. The first part of Experiments 1 and 3 examined the effects of objective differences in the stressful event on cognitive appraisals and coping. The second part examined the relationships among appraisals, coping and performance. Experiment 2 examined only the effects of objective differences.

In general, the results of these experiments provide support for Lazarus' stress and coping theory. Consistent with theory, in all

experiments stress and threat appraisals and emotionality were higher when students were confronted with a more difficult task. On in-class tests, challenge appraisals and emotion-focused coping were higher on a more difficult review test. Furthermore, a significant amount of variance was explained on the regressions for all variables, except problem-focused coping. Moreover, as predicted, there was considerable overlap among the variables in the model, resulting in a large proportion of the explained variance being related to shared variance. The high degree of overlap also resulted in a reduction of the amount of variance that could be attributed uniquely to particular variables. Despite this, a number of relationships were still evident. For example, stress was almost always related to threat and emotionality and emotion-focused coping was almost always related to problem-focused coping and off-task thoughts. However, for other variables, the interrelationships were less clear. For example, although a significant proportion of threat was explained in both Experiments 1 and 3, it appeared to be significantly related to emotionality and the secondary appraisals of uncertainty, conflict/confusion, and helplessness only in Experiment 1. There was also some indication that emotion-focused coping was negatively related to test performance. In contrast, neither challenge nor problem-focused coping consistently related to other variables. Although some variables did not relate as predicted, it is argued that this is more likely to be related to operational definitions and methodological problems than to inaccuracies in the theory.

ACKNOWLEDGEMENTS

There are a number of people who have made important and timely contributions to this thesis and it is difficult to decide with whom to begin. Dr. Donna Lamping was there at the beginning and again at the end. Donna was my supervisor for the first four years when, with her assistance, I developed the ideas for and conducted the experiments in this thesis. Now, at the end, she has provided a great deal of very helpful and detailed criticism, which has made this thesis a much better document.

I would like to thank Dr. Richard Day, who came to my rescue when Donna left McMaster, and who has guided me through many drafts of the thesis. Dick has been very patient with both the long droughts and the constant phone calls. He has always provided detailed, constructive, yet gentle criticism and has always been accommodating to the demands of my frenzied schedule.

Dr. Ian Begg rescued me at a time when I had lost confidence and direction. Not only did Ian provide moral support, his comments on earlier papers and drafts of the thesis have helped shape my thinking and, hopefully, my writing. His support and advice has helped me keep perspective on the demands and expectations involved in writing a thesis. Thank you Ian.

I would also like to thank Dr. William Carment and Dr. Arthur Cott, who have also spent many hours reading progress reports and drafts.

I'm not sure that there is anyway to adequately express the feelings I have for the support that I have received from my family.

Jane and I have struggled on parallel courses for many years. We have watched each other grow and change and she has given me the support and criticism I needed to keep going. She has also taken on many responsibilities to allow me the time I needed to work on this thesis. Without her love and support I am not sure that I could have completed it.

Samia has grown up while her mother and I have taken this long and difficult road and has made many sacrifices so that I could complete this thesis. Over the years there have been many occasions when I had to work instead of spending time with her. These times will never return, but I hope that in the future we will be able to take advantage of the time we will have. Samia has also helped ease the load on her mother and me by caring for her sister when we both needed to work.

Brianne also has lost some time, but she is young enough to forget. I have spent too many week-ends in front of the computer, listening to her play and asking for her daddy.

I would like to thank my mother, Mrs. Jean Benness, who has been patient and supportive for many years. Without her financial assistance we could not have survived. She has been sympathetic and understanding for what must seem an eternity. Thank you mom. You can finally say, "my son, the doctor". I would also like to acknowledge my father, Mr. Barry Benness Sr. Although he died many years ago, his memory has been with me. I wish he could have been here to finally see me finish. Finally, I would like to thank Paul and Emma McCully, my in-laws, who have also given us a lot of support over the years.

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Chapter 1

INTRODUCTION

Research in stress and coping has expanded and changed rapidly over the last twenty years, and there is no unifying theory to guide this research (Appley & Trumbull, 1986; Lazarus & Folkman, 1984). However, the last few years have seen some convergence of opinion with respect to theory (e.g., Appley & Trumbull, 1986).

In the 1960's, much of the research focused on defining the limits of Hans Selye's physiological, response-based theory, which looked for non-specific, physiological responses to stressful situations (Appley & Trumbull, 1986; Lazarus & Folkman, 1984). His theory was developed through experimentation on animals in the laboratory and researchers were interested in determining which stressful stimuli would evoke the stress response, as defined by the General Adaptation Syndrome or GAS (Selye, 1976). Other researchers believed that characteristics of the environment were the important factors in understanding stress (Appley & Trumbull, 1986; Lazarus & Folkman, 1984). Consequently, some researchers defined stress by the number of stressful life events that people encountered (e.g., Holmes & Rahe, 1967). However, it was demonstrated that people's behavioral responses varied considerably in reaction to stressful life events. Therefore, many researchers argued that characteristics of the

individual, including the way he or she appraised the situation, affected that individual's response (Appley & Trumbull, 1986). A relational theory, which included characteristics of both the environment and the individual (e.g., Appley & Trumbull, 1986) was developed to address the shortcomings of the stimulus and response models. Richard Lazarus' theory of stress and coping (Lazarus & Folkman, 1984) is one example of a relational theory.

This thesis begins with an overview of the development of theory and research in the area of stress and coping through a discussion of examples of stimulus, response, and relational models. The three major theoretical views are presented and it is argued that development in the area is leading to a consensus that supports a relational theory of stress, in contrast to stimulus or response theories.

The stress and coping model proposed by Lazarus and his colleagues (e.g., Lazarus & Folkman, 1984) is a good example of a relational model and is the focus of investigation for this thesis. Therefore, following discussion of the stimulus and response models, Lazarus' transactional model of stress and coping is presented in detail.

The recognition that cognitions can influence the way we cope with stressful events is part of a larger movement in psychological theory that recognizes the importance of cognitions in the determination of behavior (Appley & Trumbull, 1986; Lazarus & Folkman,

1984; Leahey, 1987). The theoretical position proposed by Lazarus e.g., Lazarus & Folkman, 1984) and examined in this thesis is a cognitive theory of stress and coping. How people appraise the demands of a task and what they believe they can do to cope with that task have a large impact on performance. When people believe that the demands of a task tax or exceed their abilities, then they will experience stress.

The tasks that are being confronted today are making ever increasing demands on individuals and are taxing or exceeding their ability to cope. Change in society is occurring at a rapid pace and an ever larger knowledge base is required to keep up with this development. Consequently, formal education is playing a large role for a greater proportion of the population. An integral part of education is being able to demonstrate that information has been acquired. The primary method for demonstrating academic achievement is through testing. Because tests are designed to test the limits of people's competence and because the outcome is important, tests and exams are stressful events.

The second section of the paper discusses evidence that supports Lazarus' model of how people appraise and cope with stressful situations. Because all three experiments in this paper have applied the model to academic tests, investigations of the factors affecting academic performance are discussed. This large body of knowledge has generally been referred to as the test anxiety literature. Lazarus'

model is compared to information-processing models, which predominate in the test anxiety literature, and it is argued that because Lazarus' model hypothesizes a bidirectional relationship between thoughts and emotions, it is better able to explain the way people think, feel and act while taking a test.

Finally, three experiments are presented and discussed that test the use of Lazarus' stress and coping model in explaining how people appraise and cope with academic tests. Specifically, the thoughts and feelings students experienced and the coping strategies they used while writing tests and exams were examined. Three experiments were conducted to test the model. The first used a simulated test, the second used both simulated tests and end-of-term university exams, and the third used weekly in-class tests.

Chapter 2

THEORETICAL DEVELOPMENT

The concept of stress has changed dramatically since it was first used to explain an individual's reactions to the demands of life (Appley & Trumbull, 1967, 1986; Lazarus, 1966; Lazarus & Folkman, 1984; Selye, 1976, 1979, 1982). The major issue in the field concerns the definition of stress. There are stimulus (e.g. life events) and response (e.g. Selye's General Adaptation Syndrome) definitions and relational (e.g. Lazarus' stress and coping model) definitions (Appley & Trumbull, 1967, 1986; Fisher, 1984; Lazarus, 1966; Lazarus & Folkman, 1984; Leventhal & Nerenz, 1983; Riley & Furedy, 1985). In addition, stress has been investigated at the physiological (e.g., Selye, 1976), the psychological (e.g., Folkman & Lazarus, 1984) and the sociological level (e.g., Pearlin, 1983).

The term stress was used in relation to the human condition as early as the 17th century (Hinkle, 1974; Lazarus & Folkman, 1984). Mason (1975) reports that Walter Cannon used the term in connection with physiology as early as 1917, and in 1935 published a paper that referred to stress as the disturbing external forces, and strain as the breakdown of the organism's ability to maintain homeostasis.

The notion of homeostasis is present in many definitions of stress. The origin of the concept of homeostasis is attributed to

Claude Bernard, a 19th century French physiologist (Lazarus & Folkman, 1984; Selye, 1976, 1982). He suggested that all living organisms had "the ability to maintain the constancy of their internal milieu, despite changes in the surroundings" (Selye, 1976, p. 12). However, it was Cannon who labelled this constancy "homeostasis" (Selye, 1976).

The next three sections present examples of stimulus, response, and relational models. The evolution of theory in this area began with the physiological theory developed by Selye (Selye, 1976, 1982). Selye's theory has had a major impact on research in the area (Appley & Trumbull, 1986) and is discussed as the primary example of a response theory. One of the shortcomings of Selye's work is that it was restricted to laboratory experiments. In contrast, most stimulus theories are based on information about major life events. Researchers in this area were largely responsible for taking stress research out of the laboratory and introducing real life events into the field of study. Therefore, the development of theory in the life-event stress literature is presented as a part of the evolution of stress research. Finally, Lazarus' theory of stress and coping is discussed as an example of a relational theory. Evidence is provided that demonstrates that both Selye and those developing life events theories added features to their theories to improve their ability to explain stress phenomena. It is argued that these additions altered both the response and stimulus theories to became more like relational theories.

Selye's General Adaptation Syndrome

Dr. Hans Selye is generally credited with introducing the concept of stress into the life sciences and is regarded as the most influential individual in the development of interest in the concept (Appley & Trumbull 1967, 1986; Lazarus & Folkman, 1984). Selye became interested in stress in 1925, when as a medical student, he became aware that many diseases produced similar symptoms. Physicians tended to ignore these common symptoms, and attended instead to symptoms that were specific to each disease.

Selye remained interested in these non-specific symptoms, which he referred to as "a syndrome of just being sick" (Selye, 1976, p. 29; 1982, p. 8), and in 1936 published his first paper in the area. He noted that sex hormones produced fairly consistent physiological changes in his experimental animals. These changes included: the enlargement of the adrenal cortex, the shrinking of the lymphatic structures, and the development of bleeding ulcers in the stomach (Selye, 1976, 1979, 1982). He found that almost all noxious stimuli, including toxic substances, cold, heat, infection, trauma, hemorrhage, and nervous irritation, produced the same physiological changes, which he called the stress response or the GAS. Selye called this nonspecific response of the body to any demand, stress (Selye, 1976) and described it as "the rate of wear and tear in the body" (Selye, 1976, p. 1). He also created the word "stressor" to label the noxious

stimuli or causal agents that produced the stress response (Selye, 1976). Selye's definition of stress was physiological. However, in later work (Selye, 1976, 1979, 1982) Selye suggested that the major stressors for humans were related to psychological factors rather than to the physiological factors that he had investigated.

The GAS consists of three stages: 1) the alarm reaction, 2) the stage of adaptation or resistance, and 3) the stage of exhaustion (Selye, 1976, 1979, 1982). Selye suggested that when an organism encounters a noxious stimulus there is an immediate physiological reaction, including tachycardia, loss of muscle tone, and depressed temperature and blood pressure. This is the shock phase of the alarm reaction. The countershock phase, when the organism begins to mobilize its defense forces, follows immediately. The stage of resistance is a continuation of the countershock phase of the alarm reaction, when the organism fully mobilizes its defenses. During this stage the physiological reactions of the alarm stage either disappear or improve, because the organism has a greater resistance to the stressor. However, it is now more vulnerable to other stressors. If the stressor is damaging enough and/or continues long enough, the organism will eventually become exhausted. During this stage of exhaustion the physiological reactions of the alarm stage will reappear and the organism will die (Selye, 1976, 1979, 1982). Selye suggested that generally only the first two stages of the GAS are

experienced. However, he also argued (Selye, 1976) that although the organism appears to return to normal homeostasis, in fact, a part of its reserve is always used up. He suggested that this was the cause of aging and was an inevitable part of life.

Selye's initial theory of stress was elegantly simple. He presented data that seemed to identify similar physiological reactions to all stressors. However, over the years, Selye was forced to modify this simple formulation. For example, in his early work Selye suggested that variations in the response of the organism to a stressor were caused by the specific effects of that stressor, and that these specific effects altered and masked the non-specific reactions (Selye, 1976, 1979). He also introduced the notion of conditioning (Selye, 1979). External conditioning occurred through pretreatment with stressors which allowed the body to adapt its responses, producing increased resistance to that stressor. Internal conditioning represented the various strengths and weaknesses of the particular body. Thus the combination of specific demands of the stressor with external and internal conditioning produced different responses in the organism, which masked the stress response.

Although Selye's model was based on the notion of homeostasis, the idea of external conditioning implied that the body does not have a fixed level of resistance or homeostasis, but could change its "normal" level and adapt to the stressor. Further research by other investigators began to produce evidence that not all stressors produce

a GAS (Lazarus & Folkman, 1984; Leventhal & Nerenz, 1983), casting doubt on the generality of Selye's theory.

In his later work, Selye suggested that some pleasant stressors did not have harmful effects on the body and introduced the term "eustress" (Selye, 1976) to label these pleasant stressors. This appeared to be inconsistent with the main premise of his theory because, according to Selye, a stressor is a noxious agent that produces the GAS, which always takes some toll on the body.

For Selye, stress is an identifiable set of physiological reactions that always occurs when an organism is confronted with a noxious stimulus, the stressor. His theory, then, defines stress as a response. Selye almost always used strong stimuli that would elicit a generalized response. For Selye, specific and individualized responses interfered with and altered the stress response in which he was interested. Selye's theory is almost exclusively a physiological theory. However, over the years, he added psychological factors. For example, he states that "emotions-love, hate, joy, anger, challenge, and fear-as well as thoughts, also call forth the changes characteristic of the stress syndrome. In fact, psychological arousal is one of the most frequent activators" (Selye, 1982, p. 14). Although he recognized the importance of these variables, Selye stated that they were beyond his field of competence (Tache & Selye, 1986), and should be examined by those who were better equipped. Although in later years Selye altered the theory, the stress reaction was always

thought to deplete to some degree the resources of the organism. The notion that all stress depleted the organism and that the stress reaction was the same for all stressors, positive or negative, was also the basis for research that examined the effects of life events on physical and psychological health (Lazarus & Folkman, 1984; Leventhal & Nerenz, 1983; Perkins, 1982).

Life Event Stress

Most of the very early research on life event stress was conducted through the retrospective study of individuals exposed to such extreme events as bombings, concentration camps and natural disasters (Janis, 1969; Lazarus, 1966; Lazarus & Folkman, 1984). For researchers concerned with life event stress, life events are defined as stressors and stress is an inferred internal state of the organism (Dohrenwend, 1986a 1986b However, because these theories emphasis the importance of the stressor, they are labeled as stimulus theories, (Dohrenwend, 1986b; Holmes & Masuda, 1974; Johnson & Sarason, 1979). Researchers (Dohrenwend & Dohrenwend, 1974; Holmes & Masuda, 1974; Rahe, 1974) suggest that the greater the number of life change units or LCUs, (see below) the higher the probability of developing a physical or psychiatric illness. The assumption underlying life event research is that the demands of an event are so great that there will be little or no variation in the response and that degree of stress

can therefore be explained solely through knowledge of the severity of the event. However, this is not the case, for even in the most stressful events there is a considerable amount of variation in the way people cope (Lazarus & Folkman, 1984).

In more recent years, the field has been dominated by the concept of life change or life-event stress. The goal of this research has been to examine the relationship between life events and physical (Dohrenwend & Dohrenwend, 1974; Holmes & Masuda, 1974: Rahe, 1974) or psychiatric illness (Dohrenwend, 1986b; Johnson & Sarason, 1979).

Dohrenwend Krasnoff, Askenasy, and Dohrenwend (1982) report that interest in the effects of stressful life events on physical and psychiatric health began in the 1930's when Meyer introduced the use of a life chart for medical diagnosis. The life chart included a medical history from birth, as well as a record of important incidents including births, deaths, graduations, failures, moves, and job changes. Research using the life chart led to the development of the social readjustment rating scale (SRRS), a 43-item checklist developed by Holmes and Rahe (1967), which included life events they judged to be stressful. The SRRS includes items ranging in severity from the death of a spouse, marriage and divorce to such items as vacations and minor violations of the law. Each item is given a weighted score based on the judgement of its stressfulness by experts. For example, death of a spouse has a weight of 100 and marriage has a weight of 50. Individuals are asked to check items that have occurred within the

recent past, usually from the last two to 12 months. The weighted scores for each item endorsed are added and the total is expressed in life change units (LCU). Rabkin and Struening (1976), in a review of the literature, report that a number of different versions have also been used including the Schedule of Recent Experience (SRE), which is scored by adding the number of items checked, and a version in which subjects provided their own subjective weights.

The conceptual model underlying the relationship between LCUs and illness, which hypothesizes a direct link between LCUs and illness, has a number of problems. To begin with, the correlation between LCUs and illness is typically below .30 (Johnson & Sarason, 1979; Kanner, Coyne, Schaefer, & Lazarus, 1981; Rabkin & Struening, 1976), suggesting that there is only a weak relationship between life stress and illness. Furthermore, because LCUs include both positive and negative events, it is implicit in the argument that positive changes can be as harmful as negative changes (Johnson & Sarason, 1979; Lazarus & Folkman, 1985; Perkins, 1982). There also are other underlying assumptions that can be criticized. For example, it is assumed that each life event is independent of others, that their effects are additive, and that each event will always elicit the same amount of stress (Perkins, 1982). The assumption that the effect of the stressor will always be the same does not recognize the possibility that the individual can develop better ways of adapting.

Most methods for assessing LCUs do not consider individual differences in the way people interpret and react to different

stressors, making no allowances for any variables to intervene between the life event and its effect on the individual's response (Johnson & Sarason, 1979; Lazarus & Folkman, 1984; Perkins, 1982). Furthermore, the life events presented on the questionnaires represent only a small sample of all the potentially stressful events a person might encounter. The SRRS was developed using a middle class, urban, hospitalized population in the north-eastern United States (Dohrenwend & Dohrenwend, 1974; Perkins, 1982) and is not necessarily relevant for other populations. Finally, it has been argued that many of the items on the SRE could be viewed as symptoms of illness or psychopathology (Dohrenwend et al., 1982; Johnson & Sarason, 1979). For example, divorce or the loss of a job could be caused by a person's inability to meet the demands of the marriage or job. Dohrenwend (1986b) also levels this criticism against the Daily Hassles Scale developed by Lazarus and his colleagues (Kanner, Coyne, Schaefer, & Lazarus, 1981).

Recent work in the area of LCUs has attempted to eliminate some of these difficulties. Sarason and his colleagues (Johnson & Sarason, 1979; Sarason, Sarason & Johnson, 1985) have developed a questionnaire, the Life Experiences Survey, which separates positive and negative events, and allows subjects to rate events on a seven-point Likert scale (-3=extremely negative; +3=extremely positive), with respect to the impact on their lives. To explain the relatively low correlations between life stress and illness, Sarason (Johnson & Sarason, 1979; Sarason, Sarason & Johnson, 1985) proposes moderator

variables that, when examined in relation to life events, increase the amount of variance explained. These moderator variables include stable personal characteristics (e.g. locus of control), prior experience, and environmental factors (e.g. social support network).

Dohrenwend (Dohrenwend et al., 1982) has developed the Psychiatric Epidemiology Research Interview (PERI) for life events, a questionnaire that includes a wider array of stressful events. However, a stressful event is still defined in terms of how most people would experience the event, thus not accounting for individual differences. More recently, Dohrenwend (1986a, 1986b) has developed a model that includes personal dispositions (e.g. genetic vulnerabilities, physical health and intelligence), recent events and ongoing social situations, including social support. Rahe (1974) also briefly describes a model which allows for subjective evaluations and psychological defenses. None of these models addresses in any detail the strategies a person could adopt to cope with any of the life events.

The original life event model did not account for all the factors that were needed to predict adequately physical or mental illness. Therefore, individual differences were included to improve the model. Again, an apparently simple model was not adequate to explain the relationship between stressors and the reactions of the individual and theorists were forced to add other features to the model to deal with poor relationships between life events and illness. All of the models discussed appear to be evolving towards one in which

environmental and person factors make significant contributions to the explanation of reactions to stressors. Models that take into account both the environment and the person have been called relational models (Lazarus & Folkman, 1984).

Lazarus' Stress and Coping Model

Lazarus' model of stress and coping is one such model. Lazarus (Lazarus & Folkman, 1984) is concerned with psychological stress and defines it as "a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being" (p. 19). Lazarus calls his model a transactional model because it "views the person and the environment in a dynamic, mutually reciprocal, bidirectional relationship (Lazarus & Folkman, 1984, p. 293). Moreover, Lazarus argues that "transaction implies a newly created level of abstraction in which person and environmental elements are joined together to form a new relational meaning" (Lazarus & Folkman, 1984, p. 294). Lazarus' model is based on the assumption that people continuously evaluate or appraise the demands of a task in relation to the resources they have available to cope with that task.

The model proposed by Lazarus and his colleagues (Lazarus, 1966, 1981, 1986; Lazarus & Launier, 1978; Lazarus & Folkman, 1984) incorporates person and environmental factors and changes the

definition of stress. Lazarus' transactional view of stress and coping suggests that the person and the environment influence and change each other, and focuses on understanding how people appraise and cope with stressful events. Lazarus (1986) suggests that "stress is best regarded as a rubric or system of interdependent variables" (p. 5) and is, therefore, a process. Furthermore, "the stress process refers to a relationship between a particular person with certain characteristics and an environment with certain characteristics" (p. 5).

The person's primary appraisal of an event with respect to physical or psychological well-being as well as the secondary appraisal of what can be done to manage the outcome of the encounter, will affect reactions to that event. The stressfulness of an event is no longer predetermined, as is the case with LCUs; any event that is viewed as problematic can evoke the coping process, thus opening the way for the inclusion of everyday events. A given transaction, an encounter of the individual with an environmental event, has many appraisals, coping strategies and emotions. It is a dynamic process which changes the person and the environment over time. The process is recursive in that as the encounter unfolds, the individual reappraises the situation.

Cognitive Appraisals. Cognitive appraisals play a central role in Lazarus' theory of stress and coping. Cognitive appraisal is an evaluative process whereby the individual continuously examines events

with respect to well-being. Primary appraisals reflect what is at stake for the individual's physical and/or psychological well-being, and secondary appraisals evaluate what strategies the individual believes are available to cope with the event. For Lazarus, the basic questions involved in primary and secondary appraisals are respectively: "Am I in trouble or being benefited, now or in the future, and in what way?" and "What, if anything can be done about it?" (Lazarus & Folkman, 1984, p. 31). Lazarus argues that the ability to predict outcomes and to take action to minimize or avoid damage is important to the appraisal process and to the individual's adaptation to the demands of life. Primary appraisals are always made in conjunction with secondary appraisals and both are evaluative processes.

The individual can make the primary appraisal that an event is irrelevant, benign-positive, or stressful. An appraisal that an event is irrelevant indicates that the event will have no impact, good or bad, on the individual. An appraisal that the event is benign-positive indicates that the outcome of the event is likely to be some benefit to the individual. However, if the event is appraised as stressful, it can be seen as either a threat, a challenge, or a harm-loss. The event is appraised as a threat if the individual believes that the outcome could be harmful or damaging. The ability to anticipate that an event is potentially harmful allows the individual to determine what can be done (secondary appraisal). An event is appraised as a challenge if there is a potential for a positive outcome. Again, the ability to

anticipate allows the person to evaluate what can be done. Finally, an event can be evaluated as a harm/loss. This indicates that something damaging has already occurred and the individual must determine what can be done in reaction to that harm/loss.

When making secondary appraisals, the individual determines what coping strategies are available and evaluates which of these strategies could best manage or cope with the task. Throughout the process, the individual reappraises the situation to evaluate whether those strategies are effective.

Figure 1 depicts the interrelationships of the variables in the model which are discussed in this section. Person and environmental factors are considered to be causal antecedents of the stressful transaction. Primary and secondary appraisals and coping are defined as mediating processes. Finally, physiological changes, feelings, and outcome are defined as immediate effects. The focus of this thesis will be primarily on the mediating processes.

Threat and challenge appraisals are the result of a complex process of evaluation which involves secondary appraisals of the relationship between the demands of the environment and the person's ability to cope with those demands. Lazarus hypothesizes that there is a bidirectional causal relationship between each of these primary appraisals and different patterns of secondary appraisals. Furthermore, these patterns of secondary appraisals are associated with different behaviors and outcomes (Lazarus & Folkman, 1984).

Figure 1

Interrelationship of Variables in the Stress and Coping Model

Causal Antecedents	Mediating Processes	Immediate Effects
Person Variables:	Primary Appraisal:Stress	Physiological Changes
Commitments	Harm/Loss	
Beliefs-assumptions,	Threat	
e.g. test anxiety	Challenge	
	Secondary Appraisals:	Positive or Negative
	e.g. Helplessness	Feelings
	Conflict/Confusion	
	Uncertainty	
Environment:	Coping:	
situational demands,	Problem-focused	Quality of outcome
constraints	Emotion-focused	
resources		
ambiguity	Reappraisal	
imminence		
	Resolution of	
	stressful encounter	

With respect to secondary appraisals, Lazarus and Launier (1978) suggest that degree of uncertainty concerning what can be done, the conflict/confusion between competing goals and/or values (see below), and helplessness are important factors in determining what coping strategies will be adopted. Moreover, positive secondary appraisals, such as feeling in control and being confident in one's ability can also reflect which coping strategies will be adopted.

Person and Environmental Factors. Lazarus and his colleagues hypothesize that there are a large number of person and environmental factors that influence a person's cognitive appraisals when encountering any event. All of these variables interact in complex ways.

For Lazarus, commitments and beliefs are the most important person factors related to cognitive appraisal. Although Lazarus does not clearly define commitment, it appears that his meaning is similar to the established definition: a responsibility or obligation to invest time and effort to accomplish a particular goal. Lazarus and Folkman (1984) argue that a commitment expresses what is important to a person and has both a cognitive and a motivational component. Lazarus suggests that people make commitments to particular goals and values. A strong commitment to a particular goal indicates that goal is more important than others and is likely to have a greater influence on the cognitive appraisals a person makes. An event

involving a goal to which a person has a strong commitment is likely to be appraised as more threatening than an event involving a goal to which a person has a weaker commitment. Furthermore, Lazarus and Folkman (1984) argue that the extent of a person's psychological vulnerability is determined by "the relationship between the individual's pattern of commitments and his or her resources for warding off threats to those commitments" (p. 51). For example, a person who has a strong commitment to academic achievement but poor test-taking skills will be more vulnerable than a person who has little commitment but good test-taking skills.

According to Lazarus, a person's beliefs, both those that are idiosyncratic and those that are shared with others, are built up over years of experience. Shared existential beliefs (e.g., belief in God) are powerful and allow a person to maintain hope and to extract meaning from seemingly random and tragic events. Beliefs are not truths, but are what people accept as being true. For the most part, people are not immediately aware of the beliefs that influence how they interpret the world and how they behave.

A person's belief about how much control can be had over the outcome of events influence what is done. For example, to succeed in school an individual must have both innate ability (e.g., intelligence) and adequate skills (e.g., test-taking skills). However, if the student believes that he or she does not have the ability to succeed, then that student may not attempt to acquire the skills. When

the student does poorly, because he or she lacks test-taking skills, this poor performance will be attributed to lack of intelligence, reinforcing the belief that the student is not capable. This is one example of how beliefs can affect cognitive appraisals and coping in an academic setting.

According to Lazarus and Folkman (1984), the individual also attends to a number of characteristics of the environment when making appraisals. These environmental factors contribute to the complexity and stressfulness of an encounter and cannot be considered in isolation because the significance and effects of environmental and person variables are interrelated.

No event is likely to be entirely novel; individuals are likely to have experienced, either directly or vicariously, events that are to some degree similar. Therefore, the current event is compared to other events to evaluate its potential for threat, challenge or harm/loss. The level of uncertainty concerning whether or not an event will occur is called event uncertainty. Evidence from the literature suggests that the greater the degree of event uncertainty, the higher the level of stress (Lazarus & Folkman, 1984). For temporal factors, it is fairly clear that continuous events, intermittent events and short duration events will affect the individual differently. Variation in other temporal factors such as imminence and temporal uncertainty tends to be associated with different levels of threat and challenge and to be related to the adoption of different coping

strategies. For example, an individual who walks into class and is told that a surprise test is being given immediately will have different coping options available than an individual who is told that the test will be in one hour. A person who is told there will be a test, but not when, is confronted with a different problem.

Lazarus makes a distinction between ambiguity and uncertainty. For example, it may be very clear (unambiguous) when the person looks at a test that he or she is not prepared, but that person could be uncertain about what to do (e.g., cheat or fail). Furthermore, according to Lazarus, the more unclear or ambiguous an event is, the greater the influence person factors will have on the appraisal process. Thus a highly ambiguous event will result in person factors making a larger contribution to a person's appraisal of the event, resulting in greater individual differences in the responses. Moreover, events do not happen in isolation, but within the context of other life events, and this context can affect the appraisal process. For example, suppose two individuals are writing the same exam. The course is a core requirement for one, but an elective, taken for interest by the other. This differential context is likely to have an effect on the appraisal process.

Coping. The last set of factors related to cognitive appraisals is the coping strategies a person believes are available. Lazarus and Folkman (1984) define coping as "constantly changing cognitive and

behavioral efforts to manage" stress (p. 178). Coping is not defined by outcome, but is defined with the words "efforts to manage" and is not restricted to successful efforts. Coping strategies can be divided into two general categories: those directed at solving the problem (problem-focused coping) and those directed at regulating emotions (emotion-focused coping). The resources a person draws on to cope include health and energy, positive beliefs (e.g. being in control), problem-solving skills, social skills, social supports and material resources. Finally, what is done to cope is determined by a person's appraisals, and is modified as a result of the person's reappraisal of changing conditions. Therefore, Lazarus believes that it is not appropriate to talk about coping styles or traits because these definitions preclude analysis of the recursive nature of the appraisal procéss.

Emotions. The construct of emotion is difficult to describe. Historically, there are two views concerning the relationship of cognition and emotion. Lazarus notes that "in the 1940s and 1950s, emotion was treated as a drive or unidimensional arousal and viewed as the causal antecedent or as the variable that intervenes between stimulating environment and the behavioral and cognitive response" (Lazarus & Folkman, 1984, p. 261). Conversely, cognitive theories hypothesized that "emotion flows from cognition" (Lazarus & Folkman,

1984, p. 261). Lazarus' theory of emotion is cognitive (Lazarus & Folkman, 1984; Lazarus, Kanner, & Folkman 1980). Although Lazarus emphasizes the effect of cognitions on emotions, he does advocate a recursive and bidirectional relationship between appraisals and emotions. This suggests that not only do appraisals affect emotions, but emotions also affect appraisals and the direction of the effect depends on the point of entry into the ongoing transaction. Lazarus argues that "although emotion and cognition are theoretically separable, in nature they are almost always conjoined or fused" (Lazarus & Folkman, 1984, p. 275). Furthermore, according to Lazarus, "emotions are thus of tremendous diagnostic value, because their intensity and quality reveal how people think they are managing what is important to them in a particular context" (Folkman & Lazarus, 1985, p. 152). Thus, according to theory, a greater commitment to a value or goal will produce higher primary appraisals of stress and threat and more intense emotions than a weaker commitment. These intense emotions will require more emotion-focused coping strategies. Furthermore, reappraisals concerning the effectiveness of coping strategies will affect the person's primary appraisals and emotions.

For Lazarus, appraisals and emotions are characterized both by change and stability. That is, appraisals and emotions change to reflect the demands of different situations. However, similar situations will elicit similar appraisals and emotions. Furthermore, people bring to each encounter a relatively stable set of beliefs and

commitments, which also have an effect on appraisals and emotions. For example, a series of tests in a particular course can be very similar. Moreover, the individual who writes the tests in this course has a relatively stable commitment to academic success and a relatively stable belief in his or her ability. Conversely, each test is somewhat different; each will cover different material and the individual may be more prepared for one test than another.

Coping efforts can modulate or change the emotions that are experienced. In fact, emotion-focused coping strategies are used for this purpose. Consider two students writing a final exam; each student may have different primary and secondary appraisals concerning the exam and thus may experience somewhat different emotions. One may believe that it is crucial to obtain an "A" on the exam in order to be admitted to a highly prestigious law school. The goal of being accepted into this school will likely affect the appraisal of the importance of the exam. Furthermore, the task of achieving an "A" will be appraised as being more difficult than the task of achieving a lower grade. If the person is uncertain about his or her ability to achieve an "A" on the exam (secondary appraisals), then the test will be appraised as more threatening. This threat to a very important goal is likely to result in a higher level of emotional arousal and this arousal will require a greater amount of emotion-focused coping. If the student believes that performance is lower than expected, when the situation is reappraised, then that student will experience even

higher levels of threat and arousal. The second student may also wish to be accepted into the same school, but realizes that other, less prestigious schools also will provide an adequate education. Therefore, a very high grade is not as important because it is not as crucial to the fulfillment of the goal. This goal of achieving a grade lower than an "A" will not be as difficult to achieve and the second student will be more certain that adequate problem-focused coping strategies are available. Consequently, this student is likely to be less threatened and aroused and therefore will not need to devote as much attention to emotion-focused coping.

Cognitive appraisals are the subjective interpretation of objective reality (Folkman & Lazarus, 1985; Lazarus & Folkman, 1984; Nisbett & Ross, 1980). Appraisals reflect people's beliefs about themselves and their environments. Lazarus and Folkman (1984) maintain that people's secondary appraisals concerning what can be done to cope may be more important than the objective level of difficulty of the task in determining the primary appraisals of stress, threat, and challenge, particularly in ambiguous situations. Appraisals of threat and challenge are generally experienced before the stressful event occurs, when the situation is most ambiguous. Therefore, according to Lazarus and Folkman (1984), and in keeping with the relationship between ambiguity and person factors already discussed, these appraisals will be most affected by internal, subjective factors.

Interrelationship of Appraisals, Coping, and Outcome. Lazarus and Folkman (1984) have put forward several hypotheses concerning how the primary appraisals of threat and challenge might be related to secondary appraisals, emotions, coping, and outcome. They suggest that challenged individuals feel capable and confident in their ability to cope with a task, feel in control and less emotionally overwhelmed. Conversely, threatened individuals lack confidence in their ability, feel out of control and emotionally overwhelmed. Threatened individuals are also likely to feel a high degree of conflict/confusion, uncertainty, and helplessness, which reflect the belief that they do not have adequate coping strategies. Because challenged individuals make secondary appraisals suggesting that they have confidence in their ability they will use different patterns of coping strategies than individuals who do not have confidence and feel threatened: challenged individuals are likely to devote more attention to the demands of the task, whereas threatened individuals are likely to devote more attention to emotional self-regulation. Therefore, if appraisals of threat and challenge are related to different secondary appraisals, which in turn are related to different patterns of coping, then people who are inclined to feel challenged are at an advantage compared to those who feel threatened because they are likely to devote more attention to problem-focused coping and presumably will perform better.

Summary

Selye's (1976, 1979, 1982) response-based physiological theory of stress was the stimulus for much research in the field. However, Selye was forced to alter his theory to include conditioning (Selye, 1979), eustress (Selye, 1976), and psychological factors such as cognitions and emotions (Selye, 1982). In fact, he stated (1982) that psychological factors were probably the most important activators of the stress response in humans, but that study of these factors was outside his area of expertise (Tache & Selye, 1986). Psychological factors, such as thoughts and emotions, are a central part of Lazarus' relational model.

Originally, the life event stress models, which were stimulus-based, attempted to define stress through knowledge of external events. However, it became evident that there was considerable variation in the responses of people to even the most catastrophic event (Lazarus & Folkman, 1984). Theorists then began to include moderator variables, such as personal characteristics, to account for the individual differences (e.g., Sarason et al., 1985). Again, individual differences in people's responses to stressful events is an integral part of Lazarus' theory.

Neither stimulus nor response theories adequately explain people's responses to stressful events. Both types of theories evolved into theories which included environmental factors and person

characteristics. Both of these factors have been an integral part of Lazarus' theory of stress and coping, which is a relational theory. It appears that relational theories are more helpful for understanding the nature of stress and coping. There is a large body of evidence that supports this hypothesis and, in the next section, literature supporting the efficacy of Lazarus' stress and coping model is discussed.

Chapter 3

EMPIRICAL EVIDENCE

The first section presents some examples of the research Lazarus and his colleagues and others have conducted to demonstrate the efficacy of the theory. The second section discusses two papers that have applied the model in academic settings. Following this, research that investigates factors affecting test performance is discussed. This research is typically called the test anxiety literature and it is argued that skills deficits, in contrast to anxiety, are a major factor in problems with academic performance. In the next section examples of treatment studies, which demonstrate that skills deficits are indeed a major factor in problems with academic performance, are presented. However, it is also concluded from these studies that anxiety does have some role in performance difficulties. In the last section the information-processing model, which is the basis for most research in the test anxiety literature, is discussed. It is argued that the bidirectional and evaluative nature of Lazarus' model makes it better able to explain how students appraise and cope with academic tests and exams.

Research on the Stress and Coping Model

Early research by Lazarus and his colleagues (e.g., Lazarus & Alfert, 1964; Lazarus, Speisman, Mordkoff & Davison, 1962; Speisman, Lazarus, Mordkoff & Davison, 1964) investigated the relationship between cognitive appraisal and physiological and behavioral reactions. In these studies, subjects viewed a film that was considered stressful, during which heart rate and skin conductance were measured. Subjects subsequently completed a self-report measure of mood and estimated the level of tension they had experienced during the film.

The first series of experiments (Lazarus & Alfert, 1964; Lazarus et al., 1962; Speisman et al., 1964) used a silent film about the puberty rites of a native Australian tribe, that depicted a crude circumcision operation performed on an adolescent boy by the adult males of the tribe. Lazarus et al. (1962) found that heart rate and skin conductance increased significantly when viewing more graphic portions of the film, indicating greater levels of arousal during these scenes. After the film, subjects reported feeling disturbed, which the authors interpreted as indicative of a threat reaction.

In a subsequent study, Speisman et al. (1964) introduced three different sound tracks that were expected to influence subjects' appraisals of the film and subsequent emotional arousal. The trauma sound track described and emphasized the stressful portions of the film. The denial sound track suggested that the operation was not

painful or dangerous and that the adolescent had looked forward to the ritual. The intellectualization sound track described the ritual in a scientific, anthropological manner. In all, four groups were included: one with no sound track and three with the sound tracks discussed. Subjects in the trauma condition reported being significantly more disturbed and experienced higher levels of physiological arousal than those in the no sound track group, whereas those in both the denial and intellectualization groups were less aroused and reported being less disturbed than the no sound track group. These results were replicated by Lazarus and Alfert (1964) and Lazarus, Opton, Nomikos, and Rankin (1965). Taken together, this early research suggested that the information subjects received affected their appraisals, as measured by self-reported level of disturbance, and their level of physiological arousal. The authors concluded that cognitive appraisals of level of disturbance influenced the level of physiological arousal.

More recently, Lazarus' theory (e.g.,Lazarus & Folkman, 1984; Lazarus & Launier, 1978) has been used to investigate how people appraise and cope with stressful events in naturalistic settings. Folkman and Lazarus (1980) were critical of the trait approach to coping and investigated the consistency of people's coping patterns. However, when they reviewed the literature they concluded that there were no good measures of how people cope with day-to-day events. Consequently, they developed the Ways of Coping Checklist (WOC), a 68-item questionnaire, which sampled a broad range of behavioral and

cognitive strategies an individual could use to cope with stress. In conjunction with their investigation of the consistency of people's coping patterns, they were interested in determining what factors influenced the coping process. In their initial research they considered five factors: what the event was about, who was involved, how the event was appraised, and the age and sex of the subject.

Information was collected seven times, at one month intervals, by interview and completion of self-report measures. Items on the WOC were classified as either problem-focused (e.g., made a plan of action and followed it) or emotion-focused (e.g., tried to forget the whole thing). Each event was classified as to content (health, work, family or other), who was involved (self-only, persons at work, family members, and others) and how it was appraised (e.g., could the situation be changed, did it have to be accepted, was more information required, and/or did the person have to stop himself or herself from doing something).

Results indicated that patterns of coping varied a great deal from event to event, but that almost all events required both problem-focused and emotion-focused coping strategies. At work, more problem-focused strategies were used than in other cases, whereas when health was involved more emotion-focused coping was used. Problem-focused coping tended to be used when the subject believed something could be done to change the situation. Conversely, emotion-focused coping was used when the subject believed that nothing could be done.

The WOC was revised in 1983 (Folkman & Lazarus, 1985; Lazarus & Folkman, 1984). Some items were replaced and the response format was changed from yes-no to a four-point Likert scale. Both the original and revised WOC (R-WOC) have been factor analyzed (Aldwin, Folkman, Schaefer, Coyne & Lazarus, 1980; Folkman & Lazarus, 1984; Folkman, Lazarus, Dunkel-Schetter, DeLongis & Gruen, 1986). Aldwin et al. (1980) used varimax rotation to derive seven factors using the original WOC, whereas Folkman and Lazarus (1985) and Folkman et al. (1986) found eight factors using the same procedure on the revised WOC. In all studies, a problem-focused factor, a mixed factor and several emotion-focused factors appeared.

In a recent series of experiments, Lazarus and his colleagues (Dunkel-Schetter, Folkman & Lazarus, 1987; Folkman et al., 1986; Folkman, Lazarus, Gruen & DeLongis, 1986) continued to focus attention on coping and its relationship to appraisals and outcomes. Subjects were interviewed once a month for 6 months, and asked to discuss the most stressful event that had occurred during that month. They also completed questionnaires. Primary appraisal was measured by 13 questions concerned with what was at stake for the individual, and secondary appraisal was measured by four items describing coping options; whether or not something could be done to change the situation, whether or not the situation had to be accepted, whether or not more information was needed and whether or not the individual had to hold back from doing something. Coping was measured by the R-WOC

and outcome was the subject's evaluation of the resolution of the problem.

Folkman et al. (1986) investigated the relationship between appraisal, coping and outcome. They found a relationship between primary and secondary appraisals, the R-WOC, and outcome. Specifically, people tended to use more planful problem-solving and self-control coping strategies when goals at work were at stake. Furthermore, when subjects felt they could change a situation, they tended to use more problem-focused coping strategies than when they felt the situation was not changeable. Changeability, planful problem-solving, and positive reappraisal (an emotion-focused coping strategy) were also positively related to outcome. Conversely, confrontive coping, which describes aggressive efforts to change the situation, and distancing were negatively related to outcome.

Folkman et al. (1986) used the same sample to investigate the relationship between appraisal, coping, health status and psychological symptoms. The study evaluated the stability of the ways people appraised and coped with different stressful situations, and asked if stability or variability had any effects on long-term outcome. They argued that in order for appraisals and coping to be related to long-term outcome, individuals must display a reasonable level of stability in appraisals and coping.

Results were that individuals displayed considerable variability in the way they appraised different situations. This was consistent

with the assumption that individuals, at least in part, make appraisals based on the demands of the situation. Furthermore, across situations, people tended to use different problem-focused coping strategies, again supporting the hypothesis that they responded to the demands of the task. Conversely, across the situations, the pattern of use of emotion-focused coping strategies tended to be more regular, suggesting that these coping strategies tended to be more affected by person factors. A significant amount of variance in psychological symptoms, but not somatic health, could be accounted for by personality variables, appraisals and coping. Importance (stakes) was positively related and planful problem-solving was negatively related to psychological symptoms.

In the last study of this series, Dunkel-Schetter et al. (1987) investigated the relationship between appraisals, coping and social support. As a part of the analysis, the authors factor analyzed the eight coping factors. Their results suggested that seven of the eight factors formed two superordinate categories. The authors reported that, in general, these two categories conceptually resembled the two original factors of problem-focused and emotion-focused coping. They used these factors in their analysis. Results indicated that the way people coped with stressful events was related to social support. In particular, problem-focused coping was positively related to the number of people used for support and the amount of informational support, tangible assistance, and emotional support accessed.

Taken together, the results of these experiments provide empirical support for several of the theoretical constructs in Lazarus's model. The way people appraise different situations tends to be quite variable, indicating that they do, indeed, take into account the demands of the situation when making their appraisals. There is also considerable evidence that individuals adopt different coping strategies in response to the demands of the situation. This is particularly evident with problem-focused coping. At work, people used more problem-focused coping strategies than in other situations. Furthermore, when they believed something could be done to change the situation, compared to when they believed nothing could be done, individuals tended to use more problem-focused coping strategies, indicating that there is a relationship between secondary appraisals and coping. People's belief that something could be done, and their adoption of problem-focused coping strategies tended to pay off, because these two factors were related to a positive resolution of the problem. Furthermore, problem-focused coping was negatively related to psychological symptoms and positively related to the use of social support. It appears that, in general, directing one's attention to solving the problem at hand tends to produce a better resolution of the problem and fewer psychological difficulties. It is also possible that subjects remember more problem-focused strategies after a successful resolution of the event than after an unsuccessful resolution (Tversky & Kahneman, 1973).

The status of emotion-focused coping strategies is less clear. Individuals tend to be more consistent in their pattern of use of emotion-focused coping across situations, suggesting that personality factors have a greater effect on the use of these coping strategies. Moreover, emotion-focused coping was especially apparent when the person believed that nothing could be done to change the situation. However, results of these experiments have not demonstrated a relationship between emotion-focused coping and outcome, perhaps because emotion-focused coping strategies are used more when it is believed that nothing can be done. Biased recall may also play a role here. That is, when successful, subjects may be less likely to recall the negative emotions experienced and the efforts required to cope with them.

Most recently, Folkman and Lazarus (1988) have investigated the relationship between coping and emotions. In keeping with the transactional nature of the theory of stress and coping, the authors sought evidence of bidirectional influence between coping and emotions. They argued that the appraisal process generated emotions and that appraisals and emotions determined what strategies would be needed to cope with the problem and the emotions. Furthermore, they argued that the situation was reappraised while the relevant problem-focused and emotion-focused coping strategies were being deployed. Based on the effects of these coping strategies, the intensity and quality of the emotions changed and if required, new coping strategies

were adopted. They concluded that if this relationship was demonstrated, then coping could be viewed as a mediator of the emotional response.

Subjects were interviewed and responded to questionnaires, once a month for six months. Subjects were asked to answer the questions with reference to the most stressful event that had occurred over the last week (a middle-aged sample) or last month (an older sample). The emotions of interest were: worried/fearful, disgusted/angry, confident, and pleased/happy. Subjects were asked to report how they felt before, during and after the event. A series of hierarchical regression analyses were computed to examine the relationship between coping and emotions following the outcome of an event. In all cases, emotions experienced before the event were entered into the equation before coping strategies.

Results indicated that coping affected emotions. Planful problem-solving was related to an improved emotional state. For example, it was negatively related to worried/fearful and disgusted/angry, but positively related to confident and pleased/happy. Other coping strategies were not as consistently related to emotions. The results of this experiment were similar to those of previous reports. That is, when efforts were directed at solving the problem, subjects felt better. Also similar to previous experiments, the relationship of emotion-focused coping with outcome variables (here they are emotions) was more variable and less clear.

Research by other authors also provide support for the model. Aldwin and Revenson (1987) investigated the relationship between coping and mental health. Their factor analysis of the R-WOC produced seven factors: three problem-focused and four emotion-focused coping strategies. The factors were somewhat different than those reported in previous studies, but they did produce the problem-focused, emotion-focused distinction. Their results also supported the bidirectional influence of mental health and coping. For example, people who reported more psychological symptoms before the study tended to experience greater stress and to use less effective coping strategies. However, coping was still related to outcome over and above the effects of prior mental health and stressfulness of the encounter. In particular, increased use of emotion-focused coping was related to poorer mental health. Conversely, when subjects believed they could use problem-focused coping strategies effectively, then problem-focused coping was related to better mental health.

There are some problems with all of these studies. The nature of the data collection appears to present the most potential for difficulty. In all these experiments, the data relate to events that could have occurred up to a month prior to the interview. Even if the event occurred as recently as earlier in the day, subjects still had to recall, after the fact, their experiences. Given that the process includes many appraisals, emotions, coping strategies and reappraisals, it is unlikely that an individual could accurately

recall them all. Furthermore, if the reports are taken after the outcome is known, then, according to Tversky and Kahneman (1973) this recall bias is likely to be systematic. For example, if the outcome were positive, according to the availability heuristic, the person would be more likely to recall thoughts, feelings and coping strategies that were consistent with a positive outcome. These related difficulties could be reduced or eliminated by collecting information about thoughts, feelings and coping strategies as close to the time they are experienced as possible and before the outcome is known.

There also continue to be some problems with the R-WOC. It has been factor analyzed in a number of studies and each has produced somewhat different factors (Aldwin et al., 1980; Aldwin and Revenson, 1987; Folkman & Lazarus, 1984; Folkman et al., 1986). The most stable appear to be the original problem-focused and emotion-focused factors.

Forsythe and Compas (1987) also examined the relationship between appraisals, coping and mental health for major events and daily hassles. Their subjects were 84 college students who were enrolled in an introductory psychology course. The students were given a list containing 104 daily events (e.g., people interrupting you when you are trying to get work done) and 71 major events (e.g., death of a relative). The students checked off the daily events that had occurred in the last two weeks and the major events that had occurred in the last six months and indicated on a 7-point Likert scale (-3=extremely negative, 3=extremely positive) how desirable the event was. After

selecting from the list the most distressing negative daily event and the most distressing negative major event, the students completed a self-report measure of their cognitive appraisals concerning each of these events. Finally, the students completed the R-WOC to assess coping and the Hopkins Symptom Checklist to assess emotional, behavioral, and somatic problems. The authors were most interested in the goodness of fit with respect to the relationship between appraisals of controllability and the coping strategies that were adopted. They factor analyzed the R-WOC and their results indicated that there were not sufficiently reliable internal consistencies to use a multi-factor approach. Therefore, they used one problem-focused and one emotion-focused coping factor.

Results indicated that, for major events, but not for daily hassles, subjects used more problem-focused coping when the event was perceived as controllable than when it was perceived as uncontrollable. The use of emotion-focused coping was not related to controllability on either major events or daily hassles. When considering the ratio of problem-focused to emotion-focused coping, subjects used relatively more problem-focused coping strategies when they felt that major events were controllable than if they felt that they were not controllable. Subjects' level of psychological symptoms was positively related to increased use of problem-focused coping during major events and increased use of emotion-focused coping during both major events and daily hassles, regardless of level of perceived controllability.

The authors hypothesized that when there is a good match between the controllability of an event and the coping strategies that are adopted, subjects would exhibit fewer psychological symptoms. Conversely, when the match was poor, subjects would exhibit more psychological symptoms. The authors believed that the ratio of problem-focused to emotion-focused coping is a better measure for evaluating the match between controllability and coping. Results supported this hypothesis. When a major event was appraised as controllable and the ratio was high, fewer psychological symptoms were reported. However, if the ratio was low in situations that were appraised as controllable, the level of psychological symptoms was higher. Conversely, when an event was appraised as uncontrollable, a low ratio was related to low and a high ratio was related to high levels of psychological symptoms.

A subsequent study (Compas, Malcarne & Fondacaro, 1988), investigated coping in 130 junior high school students ranging in age from 10 to 14 years. On an open-ended measure, subjects described one stressful interpersonal event and one stressful academic event, and rated on a 5-point Likert scale (1=complete control, 5=no control) how much control they believed they had over the event. To assess coping, the students generated a list of all the ways they could have handled each event and then placed a check mark beside each item on the list that they had actually used to cope with that event. Emotional disturbance was measured with the Youth Self-Report and the Child

Behavior Checklist, which was filled out by each child's mother. The authors reported that emotional disturbance was negatively related to problem-focused coping and positively related to emotion-focused coping. They also reported that academic stressors, compared to social stressors, tended to be appraised as more controllable and were associated with the use of more problem-focused coping strategies.

Taken together, the results of these two studies indicate that emotion-focused coping is positively related to emotional disturbance. With respect to problem-focused coping, however, results are contradictory. Forsythe and Compas (1987) reported that problem-focused coping was positively related to emotional disturbance, but Compas et al. (1988) reported that it was negatively related to emotional disturbance. Of particular interest is the relationship between the appraisal of controllability and the ratio of problem-focused to emotion-focused coping. In both studies, subjects tended to use more problem-focused coping in situations they appraised as controllable, compared to situations they appraised as uncontrollable. Furthermore, when the ratio of problem-focused to emotion-focused coping was high in controllable situations and when the ratio was low in uncontrollable situations, subjects tended to have lower levels of emotional disturbance. Subjects who do something to solve a problem, when something can be done, fare better than those who try to do something when nothing can be done. Similarly, those who attend to their emotions, rather than try to solve a problem, when nothing can

be done fare better than those who do the same when something can be done. In the next section, Folkman and Lazarus' (1985) operationalization and measurement of stress and coping in an academic setting will be examined.

Prior Research on Applications in Academic Settings

Folkman and Lazarus (1985) studied appraisals and coping in an academic setting. They collected data on university students' self-reports of emotions and coping strategies with regard to a mid-term exam at three points in time: 1) two days before the exam (the anticipatory stage); 2) five days after the exam but two days before receiving their grade (the waiting stage); and 3) five days after receiving their grade (the outcome stage). The authors hypothesized that appraisals, emotions and coping strategies would change from one time to the next and that, within each time, there would be significant individual differences in the level of these variables.

The authors developed four emotion scales (threat, challenge, harm, and benefit) each of which they used to reflect a particular cognitive appraisal. Threat and challenge emotions are considered to be anticipatory emotions that are experienced in situations whose outcome is ambiguous. Coping was measured by the R-WOC. They also obtained measures of the importance of the exam (stakes), the perceived level of difficulty, the amount of control the students believed they had over the exam, students' grade point average, and the actual grade on the test.

The authors proposed that threat and challenge appraisals, as measured by the threat and challenge emotion scales, would be highest before the exam, the point of greatest ambiguity. After the exam, students might have some idea about their performance, but there would still be uncertainty concerning their grade, and threat and challenge would remain high. However, after receiving their grade the ambiguity would be gone, and threat and challenge appraisals would decrease.

Patterns of changes in the anticipatory emotions of threat and challenge were consistent with predictions. Threat and challenge emotions were highest during the anticipatory stage and did not decrease significantly until the outcome stage.

There were also changes in the coping strategies used at the different times. The authors factor analyzed the R-WOC, using oblique rotation, and found six factors. One emotion-focused factor contained items that could be divided into three conceptual groups; therefore, the authors split this factor into three, producing a total of eight coping scales. Of these eight scales, problem-focused coping, seeking social support, emphasizing the positive, and self-isolation all decreased significantly from the anticipatory stage to the waiting stage, whereas distancing increased. From the waiting stage to the outcome stage, wishful thinking and distancing decreased significantly. The authors concluded that demands are different at each stage, and that the changing pattern of coping strategies

reflected students' responses to these demands. For example, before the exam students were able to study (problem-focused coping), but once the exam was completed nothing could be done to change the outcome. Therefore, they turned their attention to emotion-focused coping strategies such as distancing and wishful thinking.

Folkman and Lazarus (1985) also examined the relationship of stakes, level of difficulty, control and grade point average to threat and challenge emotions. The authors predicted that: 1) stakes would be positively related to both threat and challenge emotions; 2) perceived level of difficulty would be positively related to threat emotions; 3) feeling in control would be positively related to challenge emotions and negatively related to threat emotions; and 4) grade point average would be positively related to challenge emotions and negatively related to threat emotions. The R-WOC was also included in the analyses. To test their hypotheses, the authors computed two forward stepwise regression analyses at the anticipatory stage, with threat and challenge emotions as the dependent measures and difficulty, control, stakes, grade point average and scales on the R-WOC as the independent measures.

Results indicated that 44% of the variance in threat emotions could be explained by wishful thinking, stakes, perceived level of difficulty, and seeking social support. Forty-four percent of the variance in challenge emotions was accounted for and feeling in control, problem-focused coping, stakes and self-isolation were the

significant contributors. The authors concluded that past performance, as measured by grade point average, did not contribute to threat or challenge emotions. Except for the stakes variable, threat and challenge emotions were related to different cognitive appraisals and coping strategies.

Lazarus and Folkman's (1984) hypotheses are supported by these results. When people feel challenged it indicates that they believe they are in control and are likely to do something to manage the problem. On the other hand, when individuals feel threatened it indicates that they believe the test is difficult and beyond their capacity and that they need to devote attention to controlling their emotions. Consequently, the outcome is likely to be different. People who do something to solve a problem will perform better than those who spend their time minimizing emotional disturbance, particularly if the task is writing an exam. These conclusions are similar to those of Forsythe and Compas (1987), who concluded that when something could be done to solve a problem, problem-focused coping was negatively related to emotional disturbance.

Evidence from the study by Folkman and Lazarus (1985) suggests that characteristics of both the situation and the individual affect cognitive appraisal and coping. The results also demonstrate that threat and challenge emotions change in response to conditions in the environment. For example, in the anticipatory and waiting stages, there is considerable ambiguity and the possibility for both loss and

gain. Therefore, both threat and challenge emotions are present. Furthermore, each stage requires different coping strategies. Before the exam most people spend time studying (problem-focused coping), whereas in the waiting stage emotional self-regulation is more important. The demands of the task, therefore, contribute to differences in threat and challenge emotions and to determining what coping strategies are adopted.

There are problems with this study. First, the authors did not measure cognitive appraisals. Instead, they used instruments designed to measure threat and challenge emotions to infer the presence of a threat or a challenge appraisal. The scales may not be good indicators of these appraisals. In fact, the authors were cautious about interpreting the challenge scale because of its relatively low reliability. Moreover, according to Lazarus the emotion an individual experiences depends on three factors: appraisals, emotional arousal, and the effectiveness of the coping strategies that are used. Therefore, theoretically, emotions do not equal appraisals.

Second, Folkman and Lazarus (1985) examined only one stressful event. The relationship of appraisals to difficulty and importance is based on students' perceptions of the level of difficulty and importance. Although a regression analysis can provide some information concerning the relationship of level of difficulty and importance to threat and challenge emotions, the method is correlational, and no causal relationship can be inferred. Therefore,

it is important to examine self-reports of stress, threat and challenge on tests where the objective level of difficulty and importance are experimentally manipulated.

Another difficulty with this study concerns the points at which appraisals and coping strategies were measured. Although the authors minimized most of the difficulties associated with memory bias by obtaining self-reports close to the events, they did not obtain information at points immediately before, during or following the event. It is likely that the actual writing of the exam is the most stressful aspect of the transaction and Folkman and Lazarus (1985) did not examine appraisals and coping immediately before or after the exam.

According to Lazarus, the stable beliefs people hold about their abilities and the way the world operates affects the appraisals they make. Lazarus and Folkman (1984) include such things as locus of control as stable beliefs and state that a generalized belief is the same as a stable personality disposition. Therefore, the trait of test anxiety can be considered a stable belief. Vella (1984) examined the relationship between cognitive appraisals and a person's stable belief structures during the writing of a university test. Level of test anxiety was used as a measure of stable beliefs and the Cognitive Appraisal Questionnaire (see method section) was used to measure cognitive appraisals. Results revealed that students reporting high test anxiety, compared to those reporting low test anxiety, appraised

a mid-term exam as more stressful, threatening and challenging, felt more uncertain and helpless, less confident in their ability to cope with the test and less in control. The relationships demonstrated in this study indicated that the stable beliefs measured by test anxiety were reflected in the primary and secondary appraisals made on a particular test. High test-anxious subjects used more problem-focused and emotion-focused coping strategies than low test-anxious subjects. The groups were not significantly different on the number of review sessions they attended, the number of questions they asked tutors, or the grades they received on any of the exams on the course. However, high test-anxious, compared to low test-anxious, subjects reported spending significantly more time studying for the exam. These results are consistent with Lazarus and Folkman's (1984) hypothesis that people's beliefs affect the way they appraise an event. Increased study time by the high test anxious students did not appear to improve their grades. It is possible that these students had poorer study skills than low test-anxious subjects. This explanation would be consistent with evidence provided by several other studies concerning test anxiety (see below) and with Lazarus' hypothesis that high test-anxious subjects were aware before the exam that they needed to work longer hours. One contradictory result concerned the relationship of high levels of test anxiety with high levels of self-reported challenge. Theoretically, a person who feels challenged should feel confident and in control and expect to do well, therefore, challenge

should be negatively related to test anxiety.

This thesis was designed to investigate the efficacy of the application of the stress and coping theory in an academic setting. Furthermore, a number of measures traditionally used to help explain test performance (e.g., Worry-Emotionality Questionnaire, Test Anxiety Inventory) were included in this thesis. Therefore, literature that has examined the variables that are typically used to understand performance is discussed in the next section. The relationship of the models and variables in this literature is compared to those in the stress and coping literature. Typically, the relationship between test anxiety, study and test-taking skills, and performance has been explained with an information-processing model.

Factors Affecting Test Performance

This section begins with an overview of developments in the test anxiety literature. Following this, some examples of treatment studies, which demonstrate the importance of skills deficits, are discussed. Next, the information-processing model is discussed and compared to Lazarus' model. It is argued that the evaluative nature of cognitive appraisals and the bidirectional relationship between cognitions and emotions that is proposed by Lazarus are better able to explain the interrelationship of thoughts, emotions, and academic performance.

The history of the literature on test performance is similar to developments in the stress and coping literature. Early researchers

hypothesized that high levels of anxiety and poor performance represented the trait of test anxiety. This is similar to early stress research, which focused on coping styles or traits (Folkman & Lazarus, 1980). As the area evolved, research tended to refocus on state anxiety, cognitions and skills deficits, but there does not yet appear to be a satisfactory explanation of how these variables interrelate.

Most of the research on test performance classified individuals as either high or low test-anxious. Test anxiety was hypothesized as being composed of two parts, one related to cognitive activity, the other to physiological arousal. This conceptualization of test anxiety is similar to Lazarus' (Lazarus & Folkman, 1984) definition of emotion, which also includes cognitive and physiological components. The cognitive aspect began to receive more attention when Wine (1971), in a review of the literature, concluded that those who were high test-anxious indulged in more off-task thoughts, in particular, thoughts that reflected a negative self-image. Liebert and Morris (1967) constructed the Worry-Emotionality Questionnaire (WEQ) to evaluate cognitive concerns (worry) and emotional arousal (emotionality). Results indicated that worry, but not emotionality, immediately before an exam, was negatively related to how well subjects expected to do. Subsequent research demonstrated that worry was negatively related to performance on tests, but emotionality was not (Deffenbacher, 1977, 1978, 1986; Deffenbacher & Deitz, 1978; Deffenbacher & Hazaleus, 1985; Morris & Fulmer, 1976; Morris, Kellaway & Smith, 1978). However, some research (e.g., Speilberger, Anton, &

Bedell, 1976) reported that emotionality and performance are related.

In a review of the worry-emotionality literature, Deffenbacher (1980) concluded that although worry and emotionality are correlated, they are not the same construct. Emotionality tends to be related to the presence of testing cues (e.g., being in the exam room) and peaks at the beginning of the test. However, several studies (Deffenbacher, 1986; Deffenbacher & Hazeleus, 1985; Hollandsworth, Glazeski, Kirkland, Jones, and Van Norman, 1979; Morris & Leibert, 1970) demonstrated that emotionality is not the same as physiological arousal, but may reflect awareness of or concern with bodily sensations. These results are consistent with Lazarus' view that emotions are, in part, a reflection of the person's cognitive appraisal of physiological arousal. These studies also demonstrated that physiological arousal (emotionality) is not related to poor performance. Worry, on the other hand, tends to be related to evaluation and failure.

The major difficulty with this research concerns the conclusions that are drawn from the data. Most studies that concluded that worry is related to performance obtained subjects' responses to the WEQ after completion of the test. From these data the authors concluded that worry interferes with performance. For example, Deffenbacher (Deffenbacher, 1986; Deffenbacher & Hazeleus, 1985) argued that worry, generated by concerns about the task, causes high test-anxious subjects to employ less efficient coping strategies. However, because

subjects were responding after the test, it might be more convincing to argue that poor performance caused worry. This argument is supported by Morris and Fulmer's (1976) conclusion that subjects are generally aware of how difficult or easy a test is, regardless of whether they receive feedback. Even if worry was measured before the task, Lazarus suggests that worry is a consequence of the appraisal that the individual does not have sufficient coping strategies available to master the situation. Others have argued (see below) that difficulties in employing problem-solving skills result in task related interference.

A further difficulty with Deffenbacher's research, which is also a problem with Folkman and Lazarus (1985), concerns the statistical analysis. In later studies, Deffenbacher (Deffenbacher, 1986; Deffenbacher & Hazeleus, 1985) used stepwise regression, a procedure in which the variance explained by the first variable entered includes all the variance shared with other variables. If there is substantial intercorrelation among the variables, this procedure inflates the apparent contribution of worry, which enters first. Standard regression would have provided a more accurate representation of the unique contributions of the variables.

Hollandsworth et al. (1979) demonstrated that low test-anxious subjects displayed a higher level of arousal, as measured by heart rate and respiratory rate, fewer interfering thoughts, and higher levels of facilitative anxiety and achievement than high test-anxious

subjects. Furthermore, low test-anxious subjects reported making twice as many positive as negative self-statements, whereas high test-anxious subjects made an equal number. Consistent with Lazarus and Folkman (1984), the authors concluded that there was reciprocal interaction between arousal and cognitions, and that the low test-anxious subjects were able to interpret this arousal in a positive manner. The authors also recognized that study and test-taking skills were important factors in performance. They did, however, conclude that test anxiety adversely affects performance and that a possible treatment would emphasize the need for high test-anxious subjects to appraise arousal in a positive manner.

Galassi, Frierson, and Sharer (1981) reported that high test-anxious individuals have significantly more negative thoughts than low test-anxious students, but that past performance explains five times more variance in present performance than does anxiety level. Based on this, the authors concluded that performance is affected by skills deficits rather than anxiety, and that skills training would therefore be more effective in improving performance than anxiety control. Galassi, Frierson, and Siegel (1984) replicated these findings and concluded that there is little relationship between test anxiety and performance and, contrary to previous research, that there is only a small relationship between disruptive thoughts and performance.

Fulkerson, Galassi, and Galassi (1984) reported that math anxiety is not related to performance or to the cognitions a person has while doing math problems. Test anxiety has been shown to be only

weakly related to performance in a simulated test situation with children (Zatz & Chassin, 1983), for high school students' grades (Felson, 1984), and on repeated midterms with college students (Hunsley, 1985).

Consistent with Lazarus, Felson (1984) demonstrated that students' beliefs (appraisals) concerning intellectual ability or study skills are positively related to effort and performance. Zatz and Chassin (1983) also reported a modest positive relationship between cognitions and performance.

In a later study, Zatz and Chassin (1985) examined the relationship of test anxiety, cognitions, classroom environment, and performance on a grade school math test. Test anxiety was positively related to on-task thoughts and coping self-statements, constructs similar to problem-focused and emotion-focused coping, respectively. Test anxiety was related to performance only in classrooms that were perceived as threatening. Finally, with the effects of ability controlled, on-task thoughts did not correlate with performance in either the low threat or the high threat classrooms, whereas coping self-statements were negatively related to performance in high threat classrooms. Consistent with Lazarus' view, the authors concluded that attributes of the environment affect the relationship between cognitions and performance. They were also concerned with the lack of relationship between on-task thoughts and performance and the negative relationship of coping self-statements with performance. However,

these results are similar to those of Forsythe and Compas (1987) and Vella (1984), who reported that higher levels of problem-focused and emotion-focused coping are related to higher levels of emotional disturbance and test anxiety, respectively. Forsythe and Compas (1987) argued that how much one copes is related to level of distress, whereas the pattern of problem-focused to emotion-focused coping reflects how well one coped. In this case, and consistent with Vella's (1984) conclusions, it may be that high test-anxious subjects use a large number of ineffective on-task strategies and needed more coping self-statements to redirect attention to the task, whereas low test-anxious subjects use fewer, but more effective strategies and do not need to redirect their attention to the task as often.

Taken together, the results of these studies suggest that cognitive concern and emotionality, components of test-anxiety, do not cause performance decrements. There is also a strong indication that those who perform poorly lack basic study and test-taking skills. A series of studies investigating the role of study and test-taking skills and a number of intervention studies provide evidence that poor performance is more highly related to skills deficits than to test anxiety.

Culler and Holahan (1980) demonstrated that high test-anxious subjects had lower grade point averages and poorer study skills, compared to low test-anxious subjects. The authors also reported that high test-anxious subjects with good study skills had higher grade

point averages than high test-anxious subjects with poor study skills. Time spent studying was correlated with performance for high, but not low test-anxious subjects, and high test-anxious subjects spent more time studying than low test-anxious subjects. The authors suggested that the good study skills that low test-anxious students possess make studying over a certain minimum unproductive. Consistent with Lazarus' hypothesis that people make appraisals before writing a test, the authors argued that subjects who worry more do so because they are aware that they are less prepared for the test.

Benjamin, McKeachie, Lin, and Holinger (1981) demonstrated that high test-anxious students had poorer study habits and had more difficulty retrieving information than low test-anxious subjects. In particular, high test-anxious subjects used more rote memorization and had difficulty identifying important points. High test-anxious students had significantly poorer performance on questions that required an understanding and synthesis of the information. The authors concluded that high test-anxious students have trouble at all points in the learning process; they do not encode or organize the material well and have problems retrieving the information required. Consistent with Culler and Holahan (1980), the authors also argued that subjects are worried because they are aware that they are not adequately prepared. From an information-processing prospective, the authors present a scenario that resembles the transactional process suggested by Lazarus. They proposed that high test-anxious subjects believe that they are less able than their peers, and consequently

experience anxiety. This anxiety interferes with the learning and/or use of good study habits which results in the material being less well learned. Consequently, these students know less and perform more poorly than low test-anxious students.

In contrast, some research has continued to find that under certain conditions there is a relationship between test anxiety and performance. For example, Naveh-Benjamin, McKeachie, and Lin (1987) reported that in a non-evaluative setting, high test-anxious students with good study skills do significantly better than those with poor skills, but in an evaluative setting the two do not differ. The authors concluded that high test-anxious students with good study skills have problems at retrieval because of worries they experience during the test.

However, others (e.g., Bruch, 1981) suggested that high test-anxious students also possess inadequate test-taking skills. They concluded that performance is related to deficits in these skills and not to test anxiety. Paulman and Kenelly (1984) demonstrated that high test-anxious subjects with good test-taking skills did as well as low test-anxious subjects with good skills when performing a single task, but performed at the same level as high test-anxious students with poor skills when two tasks were performed simultaneously. The authors suggested that test-anxious students with good skills can compensate for the demands of off-task thoughts in most circumstances. However, when demands are too great, attending to off-task thoughts results in

poorer performance. However, it appears that university exams do not create excessive demands because high test-anxious students with good skills do not differ from low test-anxious students with good skills on grade point average.

More recently, Bruch, Pearl, and Giordano (1986) demonstrated that academic performance is related to learning strategies and test-taking skills, but not to anxiety level. They also reported that high test-anxious subjects experience more negative self-talk and believe more in these negative self-evaluations than do low test-anxious subjects. However, the authors did not investigate the relationship between these beliefs and performance. To this end, Bruch, Kaflowitz, and Fuethe (1986) examined the relationship of beliefs, self-statements and performance. Results indicated that subjects who believe they are competent, compared to those who do not, indicated that negative thoughts have less effect on their performance. Furthermore, it was the subject's belief in a negative self-statement and not the number of negative self-statements, that affected performance. The authors also raised the question of whether an individual could possess good study or test taking skills, but not use these skills because of a dysfunctional belief system. This situation would be consistent with the stress and coping model, which suggests that it is a person's beliefs about which coping strategies are available that determine which strategies will be adopted. Therefore, if a person does not believe a strategy is available, it will not be

used. This recent interest in beliefs brings the information-processing model used to explain performance decrements closer to the stress and coping model.

The evidence from these studies confirms the predictions generated by the stress and coping model. To prepare for an exam, a student must draw on many skills. It has been demonstrated that students' beliefs about their ability (secondary appraisals) affect the effort they put into the preparation (Benjamin et al., 1981; Felson, 1984). Research from this literature strongly suggests that students also differ in the problem-focused coping skills they possess to prepare for (study skills) and write (test-taking skills) exams. Furthermore, it has also been demonstrated that unskilled subjects worry, presumably because they know they are unprepared for the exam.

Treatment of Test Anxiety. Conclusions from the treatment literature also support the relationship between test anxiety, skills deficits and performance. Mitchell and Ng (1972) demonstrated that desensitization in combination with study skills training is effective in reducing anxiety and increasing performance, whereas desensitization alone has no effect on performance. Similarly, Meichenbaum (1972) demonstrated that cognitive modification, which combined a desensitization procedure and a procedure for increasing on-task thoughts, was more effective in decreasing anxiety and increasing performance than desensitization alone.

Kirkland and Hollandsworth (1980) compared the effectiveness of skills-acquisition and cue-controlled relaxation with a practice control group. Compared to the other groups, subjects in the skills-acquisition group demonstrated superior performance on an anagram task and reported knowing more effective test-taking behaviors and having fewer off-task thoughts. More recently, Dendato and Diener (1986) demonstrated that a combination of study skills and relaxation/cognitive therapy was more effective in decreasing test anxiety and increasing performance than either treatment administered separately or a control condition. Finally, Crowley, Crowley, and Clodfelter (1986) reported that two treatment programs, which taught subjects to use self-coping cognitions, produced lower test anxiety and better performance, compared to a control group.

Burchfield, Stein, and Hamilton (1985) reviewed the treatment literature and concluded that almost all treatment studies were flawed and that no convincing evidence has been presented that any particular treatment is consistently superior to any other in reducing test anxiety and increasing performance. For example, most studies compared a treatment group only to a no-treatment control group and very few included attention-placebo control groups. Moreover, studies that evaluate the effectiveness of physiological treatments (e.g., relaxation) do not obtain pre- and posttreatment physiological measures. Burchfield et al. (1985) did argue that both skills deficits and anxiety, need to be addressed in treatment. The importance of both

skills deficits and anxiety has also been conceded by Tobias (1986), who has done extensive research on the efficacy of the information-processing model in understanding test anxiety.

The Information-Processing Model. Most of the research on the relationship between test anxiety, skills deficits and performance is based on an information-processing model. In general, researchers suggest that high test-anxious individuals experience off-task thoughts that take their attention away from the primary task. However, unlike Lazarus (e.g., Lazarus & Folkman, 1984), most of these researchers do not take into account how performance itself affects interfering thoughts and emotions. Furthermore, the information-processing model does not allow for an evaluation (appraisal) of off-task thoughts. Recent research (Bruch et al., 1986) demonstrates that belief in the self-statements is an important factor in determining the relationship of self-statements with performance. Moreover, Bruch et al. (1986) suggest that beliefs are an important factor in the use of study and test-taking skills.

The basic information-processing model suggests that people have a limited capacity to process information and that when there are competing demands performance suffers. For example, Eysenck (1979) suggests that high test-anxious students are in a dual processing mode with task-irrelevant thoughts competing with relevant information for processing capacity. Working memory is hypothesized to be the most

vulnerable point. On simple tasks high test-anxious students can compensate for this divided attention with increased effort; with difficult or complex tasks, the system becomes overloaded and performance suffers. However, it has been shown that high test-anxious students have poor test-taking skills and it was argued that these poor test-taking skills caused poor performance (e.g., Bruch, 1981).

The information-processing model proposed by Tobias (1979, 1980) suggests that damaging interference can occur at input, as well as during cognitive processing and output. However, there also is evidence that high test-anxious students lack adequate study skills (e.g., Benjamin et al., 1981). Therefore, if students do not learn the material adequately in the first place, they will not have enough information available to perform well when they write the tests or exams.

Lazarus (Lazarus & Folkman, 1984) states that the transactional model of stress and coping is similar in some respects to an information-processing model. However, Lazarus argues that the evaluative nature of cognitive appraisals make them different from pure information processing. Moreover, Lazarus' model hypothesizes a bidirectional relationship between emotions and cognitions. Sarason's (1984) information-processing model resembles Lazarus' theory of stress and coping, but cannot fully explain the interrelationship between anxiety and performance. For example, Sarason states that:

> stress can be understood in terms of a call for action, a person's awareness of the need to do something about a given state of affairs. Calls for action occur in response to situational challenges and threats that lead to either task-relevant or task-irrelevant cognitions. Task-relevant cognitions are likely when a situation or task has been self-selected as a challenge. (p. 929)

But Sarason expresses some concerns with the model when he concludes that:

> the cognitive approach to anxiety, the information-processing view that anxiety arises from a self-assessment of personal deficit in meeting situational demands, has helped in the process of clarification. However, the relationship between how anxiety is experienced and how this experience affects performance is still unclear. (p. 937)

The role of appraisals and emotion-focused coping in Lazarus' model may help explain the relationship of anxiety with performance.

Burchfield et al. (1985) argue that psychological and physiological systems are interdependent, and conclude that an information-processing model does not adequately account for the relationship between physiological and cognitive components. They also argue that an interactive model best represents the components of test anxiety and their relation to performance. That is, "one system may directly or indirectly (through behavior) affect the other. Changes in

the other system then feed back and produce changes in the originally activated one" (p. 36). Although other authors (e.g., Benjamin et al., 1981; Sarason, 1984) recognize these problems with the information-processing model, they have not been able to explain the relationship of emotions with cognitions. Lazarus' stress and coping model predicts that emotions and cognitions have a bidirectional relationship.

Chapter 4

LIMITATIONS OF PREVIOUS RESEARCH AND RATIONALE

It has been concluded that the information-processing model, which is the primary model used to explain the relationship between emotions, cognitions and performance has some weaknesses (Burchfield et al., 1985; Lazarus & Folkman, 1984; Sarason, 1984). For example, Sarason (1984) argues that the information-processing model does not adequately explain how anxiety affects performance. Furthermore, it has been argued (e.g., Burchfield et al., 1985) that an interactional model, such as that proposed by Lazarus, can account for the relationship between anxiety and performance. It has also been demonstrated that many of the constructs used by authors who investigate the factors affecting academic performance resemble constructs in the stress and coping model. For example, emotionality from the WEQ, is comparable to the physiological arousal part of emotions in Lazarus' model. Moreover, worry and off-task thoughts are indicators that people believe they are experiencing difficulty on a test.

Furthermore, consistent with the view of others (e.g., Wine, 1980), Schwarzer (1986) suggests that there has been a paradigm shift towards a more cognitive approach to test anxiety and adopts Lazarus' concept of cognitive appraisals of threat and challenge to model the

relationship between anxiety and performance. Like Lazarus, he states that "cognitive appraisals lead to emotions and behavior" (p.8).

There have been a few attempts to apply Lazarus' cognitively-based model in an academic setting, but these studies have a number of shortcomings, which are addressed in this thesis. To begin with, Folkman and Lazarus (1985) included only one secondary appraisal (control) in their investigation of the variables that explain threat and challenge. Although control is important, other secondary appraisals (e.g., confidence in ability) are theoretically important in determining the appraisals of threat and challenge and are included in this thesis.

Furthermore, Folkman and Lazarus (1985) did not measure cognitive appraisals directly, but measured emotions they believed were related to cognitive appraisals. Theoretically, there is no direct relationship between emotions and their respective appraisals. Subsequent research by the authors included items that more directly measured individuals' appraisals of threat and harm. The Cognitive Appraisal Questionnaire (CAQ; Lamping, 1984), which is used in this thesis, is a self-report instrument that more directly measures an individual's cognitive appraisals.

To measure the physiological/affective component of emotions, the emotionality scale of the WEQ is included. Furthermore, because worry has been shown to be a sensitive indicator of task difficulty, it is included to determine if the experimental manipulations are strong enough to affect appraisals.

Both Folkman and Lazarus (1985) and Vella (1984) used the R-WOC, which is designed to collect information about coping in a wide variety of events. However, tests and exams are time-limited events during which many of these strategies cannot be used. Therefore, a condensed R-WOC was developed that eliminated questions which referred to activities that could not be engaged in during a test or exam (e.g., slept more than usual; I jogged or exercised).

Although Vella (1984) did obtain her measures during a test, reducing the problems of recall, neither she nor Folkman and Lazarus (1985) used statistical procedures adequate to fully explain the relationships of emotions, cognitions, skills and performance. All the experiments presented in this thesis obtained self-reports at times immediately before, during, or immediately after the tests. Moreover, standard regressions will be used to examine the interrelationships of the variables.

Neither Folkman and Lazarus (1985) nor Vella (1984) examined the relationship of appraisals or coping to outcome and Vella (1984) did not examine the relationship between primary and secondary appraisals. Furthermore, both experiments examined cognitive appraisals in the context of only one stressful test, precluding an examination of the effects of differences in the objective level of task difficulty. To address these limitations, in each of the experiments, data is collected from more than one test to evaluate the effects of objective test difficulty on cognitive appraisals and coping.

Experimental Hypotheses

Because a stressful encounter is a process that involves both environmental and person factors (Lazarus & Folkman, 1984) both of these factors must be included. Like Folkman and Lazarus (1985), this thesis examines both normative responses to differences in task difficulty and individual differences in response to the same demands. According to Lazarus (Lazarus & Folkman, 1984), different demands will produce different levels of cognitive appraisal and coping. For example, the more difficult of two tests will produce higher levels of stress, threat, and challenge. According to Lazarus, the more difficult test should also produce higher levels of worry, because worry is sensitive to task difficulty, and of emotionality, because emotions are affected by appraisals. Furthermore, subjects are likely to use more emotion-focused coping strategies to combat the increased emotionality. It is also expected that subjects will use more problem-focused coping strategies to cope with the more difficult test. To test these hypotheses, this thesis examines the effect of actual test difficulty on cognitive appraisals and coping in all three experiments. The first part of Experiments 1 and 3 and Experiment 2 present data that test these hypotheses

Folkman and Lazarus (1985) also demonstrated that there are considerable individual differences in the way people respond to the demands of a task. However, Lazarus (e.g., Lazarus & Folkman, 1984)

also hypothesizes that there should be consistency in the interrelationships of the variables in the model across similar situations. For example, stress is hypothesized to be related to threat and challenge and to emotional arousal. If this is the case, then these variables should explain a significant proportion of variance in stress. Threat and challenge are also hypothesized to be related to particular secondary appraisals. For example, Lazarus suggests that threat is related to more negative evaluations of the availability of coping strategies. Therefore, it is expected that threat should be related to conflict, uncertainty, helplessness, lack of control, and lack of confidence. Moreover, threat should also be related to emotionality, which reflects increased arousal. The second part of Experiments 1 and 3 examines these hypotheses.

Research presented in this thesis corrects some of the problems in the Folkman and Lazarus (1985) and Vella (1984) studies. In keeping with Lazarus' theory, environmental and person factors are investigated in both lab and naturalistic settings. Experiment 1 uses two simulated math tests in a lab setting to evaluate the efficacy of the model. All subjects completed the same questionnaires and wrote the same tests. However, one group wrote the first test in five minutes and the other wrote it in 10 minutes. In the first part of this experiment, the cognitive appraisals and coping strategies of the two groups on the first test were compared to evaluate the effect of time constraints. This experiment takes advantage of the opportunity

provided by the lab setting to manipulate a single variable, time to complete the test, and evaluate its effect on other variables in the model. In the second part of the experiment, a series of standard regressions were computed to evaluate the consistency of the interrelationships of the variables in the model.

Lab investigations have a number of limitations in the study of stress and coping. For example, the stressors used in lab studies cannot be as severe as those experienced in real life (Lazarus & Folkman, 1984). Despite the fact that the math test used is a part of a real achievement test, it has little importance to subjects outside the experimental setting. Therefore, it will not have the same impact on subjects as do tests that are a part of a course curriculum. Among other things, Experiment 2 tests the hypothesis that university exams are more stressful than tests taken in a lab. Experiment 2 compares the cognitive appraisals of subjects obtained before and after writing the simulated math tests with the cognitive appraisals of the same subjects obtained before and after writing university exams. In keeping with Lazarus' hypothesis that repeated observations of individuals in a naturalistic setting are important to the understanding of stress and coping, Experiment 3 examines the cognitive appraisals and coping strategies of first year students in a series of in-class, computer-administered tests. As in Experiment 1, the first part of Experiment 3 examines the effect of task difficulty on appraisals and coping and the second part examines the

interrelationship of the variables in the model.

Chapter 5

EXPERIMENT 1

Introduction

Experiment 1 was designed to simulate an actual test as closely as possible. In fact, the math test was a standard mathematics achievement test. Although the lab setting cannot recreate all of the cues that would occur in a natural setting (Laux & Vossel, 1982; Lazarus, 1981; Lazarus & Launier, 1978), it has been used to test stress and coping and test anxiety models (Laux & Vossel, 1982).

Experiment 1 was designed to examine two aspects of the model in a lab setting: normative reactions to different demands and the reactions of different individuals to the same demands. Lazarus (e.g., Lazarus & Folkman, 1984) argues that cognitive appraisals and coping are responsive to the demands of the environment. In particular, he argues that stress and threat increase as the demands of the task increase. Level of challenge also increases, as long as the individual believes there is an opportunity for mastery or gain.

In Experiment 1, subjects were divided into two groups. Initially, both groups encountered the same experience. Therefore, it was expected that before they wrote the first test, the two groups would not differ with respect to their appraisals of stress, threat,

and challenge. The two groups were then given different time limits to complete the first test. One group was allowed five minutes (group 5-10), the other 10 (group 10-5). If this manipulation is effective in making the first test more difficult, group 5-10 would do significantly more poorly than group 10-5. Moreover, this manipulation of time to complete the test should affect the appraisals of the two groups. Specifically, afterwards group 5-10 should appraise the first test as being more stressful, threatening, and challenging.

The constructs of worry and emotionality, as measured by the Worry-Emotionality Questionnaire (WEQ), have been shown to be useful in understanding test performance. If these two variables are affected by the manipulation of time constraints, this would support the hypothesis that differences in test difficulty affect cognitive appraisals. Worry is a measure of cognitive concern and emotionality represents the physiological arousal or emotions that are experienced. Lazarus and his colleagues suggest that emotions are valuable indicators of how people are experiencing a stressful situation. The worry and emotionality that subjects experience during the tests should therefore parallel self-reports of stress and threat; the groups should not differ in worry and emotionality before the first test, but group 5-10 should report higher levels of worry and emotionality after completing the first test.

Finally, with regard to coping, Lazarus (Lazarus & Folkman, 1984) argues that emotion-focused coping controls emotional arousal.

Therefore, if emotional arousal is higher in group 5-10, then these students should use more emotion-focused coping. Furthermore, because the students in group 5-10 have to work more quickly, they will need more problem-focused coping to keep up the pace.

The second part of the analysis examines individual differences in response to the same demands. The model predicts that there are consistent interrelationships between some of the variables. Lazarus views stress as any demand that "taxes or exceeds the adaptive resources of an individual" (Lazarus & Launier, 1978, pg. 296). If an event is appraised as stressful, it can be seen as either a threat, a challenge, or a harm-loss. Threat and challenge are anticipatory appraisals and are relevant to upcoming ambiguous situations. Appraisals are made with reference to the expected demands of the task and the resources believed to be available to cope with the task. The variables included as independent measures represent these constructs.

Standard multiple regressions, representing each point in time, were computed for stress, threat and challenge. To represent the stable beliefs a person holds with regard to test anxiety, the Test Anxiety Inventory (TAI) was included in all regressions. On the regressions with stress as the dependent measure the primary appraisals of threat and challenge were included as independent measures along with measures of ability [e.g., Wide Range Achievement Test (WRAT) math test score, past performance], subjects' perceptions of the level of difficulty and importance of the test, and subjects'

perceptions of how physiologically aroused they were (emotionality). When threat and challenge were the dependent measures, secondary appraisals (e.g., degree of uncertainty, conflict/confusion and helplessness, level of control and level of confidence) were included with measures of ability, emotionality, and subjects' perceptions of the level of difficulty and importance as independent variables.

According to Lazarus, these variables should explain a significant amount of variance in stress, threat and challenge. Furthermore, Lazarus argues that the variables in the model are highly interrelated and therefore, a considerable amount of explained variance should not be attributable to any one variable, but should result from shared variance. It was nevertheless expected that threat and challenge would make significant unique contributions to the explanation of variance in stress.

For threat, the secondary appraisals of degree of uncertainty, level of conflict/confusion and level of helplessness should make significant unique contributions. Level of uncertainty, level of control and level of confidence should contribute significantly to the explanation of variance in challenge. Theoretically, emotionality, perceived difficulty and importance and the ability measures should also contribute significantly to the explanation of all three appraisals. Finally, the TAI should not make a significant unique contribution to the explanation of variance in any of the three appraisals.

Folkman and Lazarus (1985) demonstrated that coping strategies change to meet the demands of the task. They also suggested that secondary appraisals were related to coping. However, they did not examine the variables that were related to problem-focused and emotion-focused coping. Appraisals before a test should be related to the coping strategies used during that test. Therefore, secondary appraisals (degree of uncertainty, degree of conflict/confusion, degree of helplessness, amount of control and confidence), were included in the regressions along with measures of ability (i.e., WRAT, performance on previous test), perceived level of difficulty and importance, emotionality, off-task thoughts (CIQ) and the TAI.

For the regressions with emotion-focused coping as the dependent variable, problem-focused coping was also included as an independent variable. According to the model, problem-focused coping is most directly related to task demands. On the other hand, the amount of emotion-focused coping that is needed will depend on the success of the problem-focused coping strategies that were used.

Emotionality represents the physiological arousal component of emotions, which are important indicators of stress in Lazarus' model. According to theory, emotionality should be related to secondary appraisals (e.g., uncertainty), perceived level of importance and difficulty, past performance and test anxiety.

Off-task thoughts have been shown to be related to performance and are an important variable in the test anxiety literature.

Therefore, the nature of the relationship between off-task thoughts and the variables in the stress and coping model will be examined. It is expected that off-task thoughts, as measured by the Cognitive Interference Questionnaire (CIQ) will be related to secondary appraisals (e.g., uncertainty), emotionality, perceived level of importance and difficulty, past performance and test anxiety.

Lazarus has argued that the coping strategies individuals use contribute to the outcome of a stressful event. Furthermore, ability and past performance, and off-task thoughts have been demonstrated to be important factors in current performance. Finally, test anxiety and emotionality also have been theoretically linked to performance. It is expected that ability and past performance, problem-focused and emotion-focused coping, the CIQ, and emotionality will make significant contributions to the explanation of variance in current performance. In contrast, it is expected that the TAI will not make a significant unique contribution to the explanation of variance in current performance.

Method

Subjects

The subjects for the first experiment were 160 McMaster university students (53 male, 127 female) with a mean age of 22, who were enrolled in a second year undergraduate Psychology course. Students were given course credit for participation.

Measures (see appendix A)

A number of questionnaires that are not included in the present study were also administered. All subjects completed the state and trait versions of the State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, & Lushene, 1970), the Stress of Life Questionnaire (SOL; Lamping, unpublished), and the Causal Dimension Scale (CDS; Russell, 1982), as well as the questionnaires described below. Only those relevant to the present study will be discussed.

Wide Range Achievement Test (WRAT; Jastak & Jastak, 1978). The 45-item arithmetic subtest of this widely used achievement test provided baseline information on mathematical ability. Subjects were given 10 minutes to complete as many questions as they could. The test begins with simple items with level of difficulty increasing through

the test. Scores are calculated by summing the number of correct answers. The WRAT is a highly reliable and valid measure that has been standardized on a large population sample across the United States (Jastak & Jastak, 1978).

State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, & Lushene, 1970). The state version of the STAI is a 20-item questionnaire that measures the level of anxiety subjects are experiencing at the moment the questionnaire is administered. Subjects respond on a 4-point scale (1=not at all, 4=very much), to such questions as: "I feel calm", "I am worried", and "I feel upset". Scores are calculated by summing the responses for each question, with some items reversed for scoring. Scores range from 20 to 80, with higher scores representing higher levels of state anxiety. The STAI has been used extensively in anxiety research (Spielberger, 1975) and has demonstrated good reliability and validity (Spielberger et al., 1970).

Test Anxiety Inventory (TAI; Spielberger, 1977). This 20-item questionnaire measures test-related trait anxiety. Subjects respond on a 4-point scale (1=almost never, 4=almost always), to such questions as: "I freeze up on important exams" and "During testing I feel very tense". Scores are calculated by summing the response on each item, with one item reversed for scoring. Scores can range from 20 to 80,

with higher scores representing higher levels of test anxiety. The TAI is widely used in research on test anxiety and is highly correlated with other measures of test anxiety (Spielberger, Gonzalez, Taylor, Algaze & Anton, 1978).

Mathematics Anxiety Scale (MAS; Richardson & Woolfolk, 1980). This 40-item questionnaire, a revised edition of the Math Anxiety Rating Scale, assesses math trait anxiety. Subjects indicate on a 5-point scale (1=not at all, 5=very much), how frightened they are by such things as: "thinking about an upcoming math test" and "taking an exam in a math course". Scores are calculated by summing responses on each item. Scores range from 40 to 200, with higher scores representing higher levels of math anxiety.

Demographic Information. Subjects provided relevant academic information (e.g., major, grades, length of time since last math/statistics course, year in university). High school average and average during the previous year were rated on a 5-point scale (1=A, 5=F). Time since last math test was the length of time in years since taking a math or statistics course (e.g., 0=this year, 1=last year).

Worry-Emotionality Questionnaire (WEQ; Liebert & Morris, 1967). This 10-item questionnaire measures the level of anxiety, both cognitive concerns (worry) and emotional arousal (emotionality), at a

particular moment in time. Subjects respond on a 5-point scale (1=the condition does not describe my present condition, 5=the condition is very strong) to such questions as " I feel regretful" (worry) and "I am nervous" (emotionality). Five items measure worry and five measure emotionality. Responses are summed to obtain separate worry and emotionality scores. Scores range from 5 to 25, with higher scores representing higher levels of worry or emotionality, respectively. Reliability in a number of studies is high; coefficient alpha is in the .79 to .88 range (Deffenbacher & Hazaleus, 1985; Morris & Fulmer, 1976). Furthermore, there is ample evidence to suggest that this is a valid measure, in that worry has been demonstrated to be negatively related to academic performance (e.g., Deffenbacher & Hazaleus, 1985), and emotionality has been demonstrated to be related to test anxiety (Deffenbacher, 1978; Deffenbacher & Hazaleus, 1985).

Math test. Two 20-item math tests were constructed, using a split-half procedure, from the mathematics computations subtest, level 19, Form A of the Canadian Achievement Test (Canadian Test Centre, 1983). This test measures achievement of high school students and covers grades 9.6 to 12.9. Scores on the math subtests are calculated by summing the number of correct responses. The test was standardized and normed in 1980-81 with approximately 40,000 students from across Canada (Canadian Test Centre, 1983).

Cognitive Appraisals Questionnaire (CAQ; Lamping, 1983). The CAQ, a 12-item questionnaire, assesses the primary and secondary appraisals as described by Lazarus and his colleagues (Folkman & Lazarus, 1985; Lazarus & Launier, 1978). Subjects responded on a 7-point scale (1=not at all, 7=extremely) to such questions as "To what extent do you perceive this test as a threat" and "How much control do you feel you have over the test at this point" and gave estimates of the importance of the test and the level of difficulty.

Cognitive Interference Questionnaire (CIQ; Sarason & Stoops, 1978). This 11-item questionnaire measures task-irrelevant thoughts that subjects experience while completing a test. Subjects indicate on a 5-point scale, (1=never, 5=very often) the extent of off-task thoughts they experience. Questions include "I thought about my level of ability" and "I thought about how poorly I was doing". Scores are calculated by summing responses to the first 10 items. The 11th item, which ask subjects to indicate the degree their mind wandered during the test, was not included in any analyses. Scores range from 10 to 50, with higher scores representing higher levels of off-task thoughts. Previous research has demonstrated that the CIQ is positively correlated with test anxiety (Paulman & Kennelly, 1984; Sarason & Stoops, 1978) and negatively correlated with performance (Paulman & Kennelly, 1984).

Revised Ways of Coping (R-WOC; Lazarus & Folkman, 1984). The Revised Ways of Coping is a 67-item checklist covering a wide range of coping strategies relevant to a stressful situation. Subjects indicate on a 4-point scale (0=does not apply, 3=used a great deal) which coping strategies they used during a stressful situation. Examples are: "Hoped a miracle would happen" and "I tried to analyze the problem in order to understand it better". The condensed version used in this thesis consists of a subset of 32 items. Items that were not relevant to writing a test (e.g., I jogged) were eliminated. The problem-focused coping scale included ten items and the emotion-focused coping included 22 items. Scores on each scale were calculated by summing responses to items on each scale. Subjects completed the full R-WOC and scores for both the full R-WOC and the condensed R-WOC were calculated from the same questionnaire. Correlations were computed between the problem-focused scale of the full R-WOC and the problem-focused scale of the condensed R-WOC, and between the emotion-focused scale of the full R-WOC and the emotion-focused coping scale of the condensed R-WOC. These were done separately for the ten and five minute tests because it was felt that the demands of the two tests would be different and that both R-WOC scales should reflect these differences.

Correlations between scales on the full and condensed R-WOC were all high and significant. On the ten minute test, the full problem-focused scale correlated .86 (n= 167, (p< .001) with the condensed

problem-focused scale, and the full emotion-focused scale correlated .96 (n= 168, (p< .001) with the condensed emotion-focused scale. On the five minute test, these correlations were .86 (n= 173, (p< .001) and .96 (n= 168, (p< .001), respectively. These high correlations indicate that the condensed R-WOC reflects essentially the same coping strategies as the full R-WOC when students are taking a test.

General Procedure

Subjects were randomly assigned to one of two time-order groups based on subject number. Each subject was randomly assigned a 4-digit number, those with an even number in the 10's column were assigned to group 5-10 and those with an odd number were assigned to group 10-5. Subjects in the first time-order group (group 5-10) were given five minutes to complete the first math test and ten minutes to complete the second. Conversely, subjects in the second time-order group (group 10-5) had ten minutes to complete the first test and five minutes to complete the second test. Order of presentation of the two math tests also was counterbalanced based on the number in the 1's column. Subjects with an even number wrote test A first and those with an odd number wrote test B first.

Within each time order, subjects were assigned at random to one of three test administration settings: 1) individual computer administration; 2) individually pencil and paper administration; and 3) classroom pencil and paper administration. All subjects were

offered up to five dollars as a bonus based on their performance on the math tests. Because setting was not relevant to the hypotheses being tested in the thesis, it was not included as a factor. Details of procedures specific to each setting can be found in Appendix B.

Subjects were given the same five sets of questionnaires and two math tests (see Table 1). The first set of questionnaires consisted of the STAI, SOL, Demographic information, TAI, MAS, WEQ, and CAQ; the second set of questionnaires contained the WEQ, CAQ, CDS, CIQ, and WOC; the third set the WEQ and CAQ; the fourth set the WEQ, CAQ, CDS, CIQ, and WOC; and the fifth set the WEQ and CAQ.

At the beginning of the experiment, subjects were given a brief explanation of the study, and were then asked to provide informed consent (see Appendix B). Following this, the arithmetic subtest of the WRAT was administered to subjects with the instruction that they had ten minutes to complete the test. After completing the arithmetic subtest of the WRAT, subjects were told that the experiment would be administered in sections and were then given the first set of questionnaires. After completing the first set of questionnaires, the first math test was presented. Subjects were given time to read the instructions, reminded of the length of time allowed to complete the test, and told to begin. Subjects were provided with a constant reminder of the time elapsed (see Appendix B for details because the method giving time feedback varied with setting). When subjects

Table 1

Order of Presentation of Questionnaires and Tests for Experiment 1

Time	Questionnaires
	WRAT
Before First Math Test	First Set of Questionnaires: (STAI, SOL, Demographic Information, TAI, MAS, WEQ, CAQ)
First Math Test	
After First Math Test	Second Set of Questionnaires: (WEQ, CAQ, CDS, CIQ, R-WOC)
Grade Returned	
Before Second Math Test	Third Set of Questionnaires: (WEQ, CAQ)
Second Math Test	
After Second Math Test	Fourth Set of Questionnaires: (WEQ, CAQ, CDS, CIQ, R-WOC)
Grade Returned	
After Second Grade Returned	Fifth Set of Questionnaires: (WEQ, CAQ)

completed the test, or when time ran out, the second set of questionnaires were completed. While subjects completed these questionnaires, the math test was scored.

After completing the second set of questionnaires, subjects received their grade on the math test. Immediately before the second math test, subjects completed the third set of questionnaires. Following completion of the second math test, subjects completed the fourth set of questionnaires, while the tests were scored. After subjects completed the fourth set, grades on the second test were returned to students, followed by completion of the fifth set of questionnaires. At the end of the experiment, subjects were informed they would be debriefed when all participants had completed the experiment. Subjects were asked not to discuss the experiment with anyone. At the conclusion of the experiment, the experimenter provided all subjects with a description of the study and answered any questions about the study.

Results

Two types of analyses were conducted in this experiment: one used MANOVAs, ANOVAs, and MANCOVAs to examine changes over time and between groups and the other used standard multiple regression to examine individual differences. MANOVAs were computed to examine group differences on baseline measures. To analyze the effects of time constraints on performance, a 2x2 ANOVA was computed. To analyze the effects of actual task difficulty on cognitive appraisals and coping, planned contrasts were calculated. Because specific directional hypotheses were made a priori for comparisons after the first test, one-tailed *t*-tests were computed for post-test comparisons between the groups. However, because the hypotheses concerning pretest measures were not directional, two-tailed *t*-tests were calculated for comparisons on means obtained before the first test. Furthermore, because there was a significant difference between groups on perceived level of difficulty before the first test, a MANCOVA was conducted to statistically control the effects of perceived level of difficulty.

To examine the interrelationships of the variables, standard multiple regressions were calculated. According to Tabachnick and Fidell (1983), with standard regressions, the significance test of a regression coefficient is sensitive only to the unique contribution of

that variable to the regression. Therefore, an important variable that shares variance with other variables in the regression may not make a significant unique contribution. Consequently, they advocate reporting and interpreting zero-order correlations between the dependent variable and independent variables. However, they also suggest using a conservative F-test which controls for probability level on multiple post-hoc tests. Zero-order correlations are reported and, where relevant, are interpreted in this thesis. Tabachnick and Fidell (1983) also advocate reporting shared variance, which is the total amount of variance explained minus the amount of variance explained by the unique contribution of variables.

When using independent variables that are correlated, multicollinearity can be a problem. However, there is no consensus about the meaning of the term (Pedhazur, 1982). According to Tabachnick and Fidell (1983), two indicators that multicollenearity may be a problem are correlations between independent variables that exceed .99 and high squared multiple correlations (SMC) or low tolerances (1-SMC). Very high SMCs indicate that one variable is almost perfectly predicted by a linear combination of other independent variables. No variables in any of the regressions had tolerances below about .25 and very few were below .3, indicating that multicollinearity was not a problem in this experiment. Finally, in this experiment missing data were handled by excluding subjects only on analyses for which they were missing data. Consequently, there are slight differences in degrees of freedom across analyses.

The results for Experiment 1 are divided into three sections. The first section compares the two time-order groups on relevant pretest baseline ability and anxiety measures. The second section, on group differences, presents data relevant to the hypothesis that the actual difficulty level of a test affects cognitive appraisals, emotions and coping. The last section, which examines individual differences, presents a series of regression analyses that explores the interrelationships between the variables in the model.

Baseline Comparability Analyses

In order to determine if the two time-order groups were comparable on baseline performance and anxiety measures before the experiment, two MANOVAs were computed (see Table 2 for means and standard deviations). A one factor MANOVA (group 5-10 vs. group 10-5), with high school average, average last year, number of years since last math course and performance on the arithmetic subtest of the WRAT as dependent measures, was computed to determine if the two time-order groups differed on past performance and math-related experience. There were no significant multivariate effects for group [$F(4,167)=0.53$, $p>.05$], indicating the groups did not differ at baseline on performance-related variables.

Table 2

Means and Standard Deviations of Baseline Measures for Experiment 1

Group	WRAT	High School Average	Average Last Year	Years Since Last Math Test
5-10				
M	31.17	2.06	2.56	2.52
SD	4.65	0.76	0.77	1.02
N	90	86	88	90
10-5				
M	30.63	2.21	2.64	2.65
SD	4.94	0.72	0.73	1.24
N	90	89	89	89

Group	Test Anxiety	State Anxiety	Math Anxiety
5-10			
M	42.45	38.96	85.19
SD	11.13	7.74	23.39
N	89	90	84
10-5			
M	39.93	38.42	89.65
SD	10.50	8.02	26.88
N	90	90	83

A one factor MANOVA (group 5-10 vs. group 10-5), with state anxiety, test anxiety and math anxiety as dependent measures, was computed to determine if the two groups differed on level of anxiety. There were no significant multivariate effects for group [$F(3,162)=1.94$, $p>.05$], indicating that the groups did not differ before the math tests on state, test or math anxiety.

Group Differences

Test performance. Data are presented that test the hypothesis that manipulating the time to complete the tests affects performance. As indicated in the method section, the two time-order groups were presented with the same questionnaires and information. It is not until they began the first test that the procedure for the two groups differed. Group 5-10 completed the five-minute test first and the 10-minute test second, while the order was reversed for group 10-5. If time constraints influence performance, then scores on the five-minute test would be significantly lower than scores on the 10-minute test. Furthermore, if performance differences are due to time constraints and not to group differences, the groups should not differ on their overall performance on the two tests. To test this hypothesis, a 2 (group 5-10 vs. group 10-5) by 2 (Repeat; 1st test vs. 2nd test) ANOVA with repeated measures was computed with test performance as the dependent measure (see Table 3 for means and standard deviations).

Table 3

Means and Standard Deviations For Coping and Test Performance for Experiment 1

Group	Problem-Focused Coping	Emotion-Focused Coping	Test Performance
First Test			
5-10			
M	10.46	16.08	12.54
SD	5.01	10.65	4.28
N	87	87	90
10-5			
M	11.07	15.97	15.54
SD	4.92	11.27	3.41
N	85	87	90
Second Test			
5-10			
M	10.50	12.85	16.38
SD	5.20	10.25	3.43
N	88	84	90
10-5			
M	9.84	14.46	12.94
SD	4.34	11.35	4.53
N	88	85	90

There was a main effect of Repeat [F (1,178)=5.96, p<.05], and an interaction between Group and Repeat [F (1,178)=162.02, p<.001], but no main effect for Group [F (1, 178)=.17, p>.05]. The main effect for Repeat indicated that subjects performed significantly more poorly on the first than the second test. With respect to the interaction, planned comparisons between the group means for test one [t (178)=5.20, p<.001] and test two [t (178)=5.73, p<.001] indicated that students obtained significantly lower grades on the five-minute test than on the 10-minute test. It can be concluded that the time constraints significantly affected test performance, with students who wrote the test in five minutes doing significantly more poorly than those who wrote the test in 10 minutes.

Effect of objective task difficulty on stress, threat and challenge. Lazarus and his colleagues (e.g., Folkman & Lazarus, 1985) argue that objective task difficulty affects appraisals. Therefore, it was hypothesized that objective task difficulty would affect appraisals of stress, threat and challenge. Specifically, it was hypothesized that before the first test the two groups would not differ on levels of stress, threat and challenge. However, after the first test, subjects who had taken the five minute test would report significantly higher levels of stress, threat and challenge than those who had taken the ten minute test. Appraisals of the level of difficulty and importance were included in the analysis, though it was

expected that the groups would not differ with respect to these variables before the test. Only the first test was included, because to this point, all subjects had completed the same tasks. A 2 (group 5-10 vs. group 10-5) by 2 (Time; before the first test vs. after the first test) MANOVA with repeated measures on the Time factor was computed with stress, threat and challenge and perceived level of importance and difficulty as dependent measures (see Table 4 for means and standard deviations).

There were significant multivariate main effects for Group [F (5,167)= 4.12, $p< .001$], Time [F (5,167)= 25.87, $p< .001$], and a significant Group by Time interaction [F (5,167)= 3.88, $p<.002$]. Two-tailed t-tests were computed to analyze non-directional comparisons before the first test and one-tailed t-tests were used to analyze directional hypotheses after the first test. Consistent with the hypothesis, stress [$t(178)=.144$, $p>.05$], threat [$t(178)=.061$, $p>.05$] and challenge [$t(178)=.083$, $p>.05$ were comparable across groups before the test. However, before the test was written, the group that wrote the 10-minute test first believed that the test would be more difficult [$t(178)=2.01$, $p<.05$] and more important [$t(198)=1.99$, $p<.05$]. After the test, subjects who wrote the five-minute test reported significantly higher levels of stress [$t(179)=3.71$, $p<.001$] and threat [$t(179)=1.78$, $p<.05$], but not challenge [$t(178)=1.46$, $p>.05$].

The fact that the groups differed in their perception of the level of difficulty and importance before the first test is a

Table 4

Means and Standard Deviations by Group of Cognitive Appraisals for Experiment 1

Group	Stress	Threat	Challenge	Importance	Difficulty	Worry	Emotionality
Before the First Test							
5-10							
M	2.32	2.03	4.13	2.58	3.91	10.13	8.41
SD	1.24	1.35	1.66	1.49	1.47	3.54	3.21
N	90	90	90	90	90	90	90
10-5							
M	2.30	2.05	4.15	3.03	4.33	9.91	8.94
SD	1.23	1.30	1.54	1.51	1.32	3.96	3.79
N	88	88	88	87	87	89	89
After the First Test							
5-10							
M	3.02	2.13	4.00	2.88	2.92	9.88	8.96
SD	1.61	1.39	1.73	1.63	1.32	4.12	3.50
N	90	90	89	88	88	90	90
10-5							
M	2.23	1.80	3.62	3.17	2.90	8.22	7.84
SD	1.23	1.11	1.75	1.62	1.37	3.77	3.06
N	89	89	89	90	90	90	90

potential confound with respect to the effects of actual test difficulty. Therefore, further analyses were required to statistically control for this confound.

In order to eliminate differences due to perceived difficulty and importance, a 2 (group 5-10 vs. group 10-5) by 2 (Time; before the first test vs. after the second test) repeated measures MANCOVA was computed with pretest perceived difficulty and importance as covariates and stress, threat and challenge as dependent measures. Even after the effects of pretest perceived difficulty and importance were covaried out there was still a significant effect of the interaction of Group and Time on stress [F (1,171)= 19.90, $p< .001$] and threat [F (1,171)= 8.44, $p< .005$]. However, there were still no significant effects for challenge [F (1,171)= 3.54, $p> .05$]. Similar to the previous analysis, it can be concluded that after the test, stress and threat were affected by the actual level of task difficulty.

Effects of objective task difficulty on worry and emotionality. To eliminate the potential confound of perceived difficulty and importance a 2 (Group; 5-10 vs. 10-5) by 2 (Time; before vs. after the first test) repeated measures MANCOVA was computed with pretest perceived level of difficulty and importance as covariates and worry and emotionality as dependent measures (see Table 4 for means and standard deviations). Similar to the MANCOVA with stress, threat, and

challenge, even after the effects of perceived difficulty and importance were accounted for, there was still a significant interaction between Group and Time [F (2,173)= 9.17, p< .001]. There were also significant univariate effects of the interaction of Group and Time on worry [F (1,173)= 11.14, p< .001] and emotionality [F (1,173)= 16.13, p< .001]. These results suggest that worry and emotionality are affected by level of task difficulty even after differences in perceived level of difficulty and importance are controlled for.

Two-tailed t-tests were computed to analyze the before differences and one-tailed t-tests were computed to analyze the after differences. As predicted, levels of worry [t(179)=0.40, p>.05] and emotionality [t(179)=1.02, p>.05] did not differ significantly before the test. However, after the test, those who wrote the five-minute test were significantly more worried [t(180)=2.81, p<.005] and more emotionally aroused [t(180)=2.27, p<.05] than those who wrote the 10-minute test.

Ways of Coping. A one-factor MANOVA was computed to examine the effects of actual test difficulty on the condensed R-WOC measured after the test. It was predicted that the group that wrote the five-minute test would use more problem-focused and emotion-focused coping strategies. However, there were no significant differences between the groups for either problem-focused [F (1,169)= 0.67, p>.05] or emotion-

focused [F (1,169)= 0.00, p>.05] coping (see Table 3 for means and standard deviations).

Discussion

Baseline comparability analyses indicated that the groups did not differ with respect to past performance or level of pretest anxiety. Analyses of group differences in test performance indicated that overall performance on both tests was comparable for the two groups. On both test one and test two, the group given five minutes to complete the test, compared to the group given 10 minutes, earned significantly lower grades, indicating that time constraints make the test more difficult.

As predicted, both groups reported comparable levels of stress and threat before the first test; however, subjects who wrote the first test in five minutes reported significantly more stress and threat after that test than those who wrote the first test in 10 minutes. Furthermore, subjects who wrote the first test in five minutes reported significantly more worry and emotionality after the test, but not before. It appears that stress and threat respond to differences in the task demands even in a relatively unimportant lab test. The manipulation of time to complete the test affected subjects' stress and threat appraisals in a manner consistent with stress and coping theory. That is, a higher level of difficulty produced higher

levels of stress and threat. Similarly, subjects who took the more difficult five-minute test were also more worried and reported higher levels of emotional arousal after the test. These results support the validity of these measures of stress and threat as being representative of stress and threat appraisals as described by Lazarus.

In contrast, challenge did not respond at all to differences in actual level of difficulty. Furthermore, the manipulation did not affect problem-focused or emotion-focused coping.

Individual Differences

To understand how cognitive appraisals contributed to differences in the way subjects responded to the tests, standard multiple regressions were calculated for four points in time: before the first math test (time one); immediately after the first test, but before the grade was given (time two); after the grade was given, but before beginning the second test (time three); and after the second test, but before the grade was given (time four).

Standard multiple regressions, representing each point in time, were computed for each variable. Performance on the previous math test (for time two and three, this was test 1 and for time four this was test 2) was included in all regressions after time one. In all equations, the amount of variance reported was the adjusted R squared,

which corrects for sample size. The amount of unique variance contributed by individual variables was the squared semi-partial correlation between that variable and the dependent variable.

All subjects encountered the same procedure until they took the first test. Therefore, the two groups were combined for the regressions calculated on data before the first math test. However, once the two groups began the first test, they had different experiences: the first group completed the five-minute test first, while the other group completed the 10-minute test first. Therefore, given that the individuals in the two groups encountered different experiences, and consistent with the theory of stress and coping (Folkman & Lazarus, 1985), it was expected that these different demands would have a differential effect on cognitive appraisals. The remainder of the regression analyses were, therefore, computed separately for the two groups. In all, seven regressions were computed for each variable.

Stress. Seven standard multiple regressions were computed with stress as the dependent variable and threat, challenge, importance, perceived difficulty, WRAT math subtest, the TAI, and (after time 1) performance on the previous math test as independent variables. As predicted, a significant amount of variance in stress could be accounted for by the variables in the model. Results indicated that

between about 54% and 68% of the variance in stress could be explained (see Tables 5 to 7). The majority of this variance, between about 40% and 50% of the total variance, related to shared variance, suggesting that, as predicted, there were substantial interrelationships among the variables. Examination of the zero-order correlations suggested that this was, in fact, the case. For stress, correlations larger than about .42 would be considered significant using the conservative F-test proposed by Tabachnick and Fidell (1983). Emotionality and threat always had the highest zero-order correlations with stress. On the other hand, at best challenge tended to be moderately correlated with stress whereas past performance (which was negatively correlated) tended to be minimally related. Emotionality contributed a significant amount of unique variance on all regressions and threat contributed unique variance on all but two. Contrary to expectations, challenge and past performance contributed unique variance on only two regressions. However, as predicted, test anxiety did not contribute significant unique variance and generally had low to moderate zero-order correlations with stress.

Threat. Seven standard multiple regressions were computed with threat as the dependent variable and emotionality, uncertainty, conflict/confusion, helplessness, control, confidence, importance,

Table 5

Standard Multiple Regressions on Primary Appraisals Before the First Test in Experiment 1

Stress (n=176)

Variable	DV	1	2	3	4	5	6	7	b	B	sr^2
1.WRAT	-.21	--							-.01	-.05	
2.TAI	.28	-.19	--						-.01	-.07	
3.Importance	.25	-.01	.10	--					.01	.01	
4.Difficulty	.31	-.21	.03	.09	--				.07	.08	
5.Threat	.69	-.16	.25	.21	.22	--			.40****	.43	.13
6.Challenge	.32	.09	.13	.26	.32	.20	--		.08	.10	
7.Emotionality	.68	-.22	.49	.25	.21	.48	.26	--	.16****	.45	.09
										R^2=.65	
										Adj R^2=.64	
						F(7,167)=45.07, p<.001				R=.81	

Threat (n=175)

	DV	1	2	3	4	5	6	7	8	9	10	b	B	sr^2
1.WRAT	-.16	--										.01	.04	
2.TAI	.25	-.19	--									-.01	-.05	
3.Importance	.21	-.01	.10	--								.12*	.13	.02
4.Difficulty	.23	-.21	.03	.09	--							.00	.00	
5.Uncertainty	.50	-.30	.32	.06	.39	--						.20**	.24	.03
6.Conflict	.44	-.36	.39	.08	.27	.56	--					.10	.10	
7.Helpless.	.42	-.29	.34	.01	.36	.58	.66	--				.08	.11	
8.Control	-.30	.30	-.23	-.09	-.10	-.36	-.42	-.45	--			-.06	-.08	
9.Confidence	-.37	.30	-.28	-.06	-.20	-.58	-.49	-.51	.45	--		-.00	-.01	
10.Emotionality	.48	-.22	.49	.25	.21	.44	.48	.39	-.20	-.37	--	.10****	.27	.04
													R^2=.37	
													Adj R^2=.33	
									F(10,164)=9.47, p<.001				R=.61	

Challenge (n=175)

	DV	1	2	3	4	5	6	7	8	9	10	b	B	sr^2
1.WRAT	.09	--										.06*	.17	.02
2.TAI	.13	-.19	--									.00	.01	
3.Importance	.26	.01	.10	--								.24****	.23	.05
4.Difficulty	.32	-.21	.03	.09	--							.26**	.23	.04
5.Uncertainty	.29	-.30	.32	.06	.39	--						.21*	.21	.02
6.Conflict	.16	-.36	.39	.08	.27	.56	--					-.11	-.10	
7.Helpless.	.26	-.29	.34	.01	.36	.58	.66	--				.15	.18	
8.Control	-.14	.30	-.23	-.09	-.10	-.36	-.42	-.45	--			-.06	-.07	
9.Confidence	-.07	.30	-.28	-.06	-.20	-.58	-.49	-.51	.45	--		.22*	.20	.02
10.Emotionality	.26	-.22	.49	.25	.21	.44	.48	.39	-.20	-.37	--	.06	.14	
													R^2=.27	
													Adj R^2=.23	
									F(10,164)=6.05,p<.001				R=.52	

*p<.05. **p<.01. ***p<.001

Table 6

Standard Multiple Regressions on Stress
for Group 5-10 in Experiment 1

After the First Test (n=86)

Variable	DV	1	2	3	4	5	6	7	8	b	B	sr^2
1.WRAT	-.25	--								-.05	-.15	
2.Test One	-.24	.59	--							-.02	-.06	
3.TAI	.35	-.14	-.08	--						.02	.11	
4.Importance	.37	.11	.15	.04	--					.06	.07	
5.Difficulty	.26	-.14	-.34	.08	.17	--				.10	.09	
6.Threat	.56	-.11	-.20	.17	.31	.15	--			.23*	.20	.02
7.Challenge	.36	.15	.05	.02	.52	.29	.21	--		.15*	.17	.02
8.Emotionality	.70	-.09	-.08	.36	.33	.09	.54	.25	--	.21***	.46	.12
												R^2=.64
											Adj	R^2=.60
												R=.80

$F(8,77)=16.832$, $p<.001$

Before the Second Test (n=89)

Variable	DV	1	2	3	4	5	6	7	8	b	B	sr^2
1.WRAT	-.18	--								.02	.07	
2.Test One	-.35	.60	--							-.10*	-.23	.03
3.TAI	.21	-.10	-.09	--						.00	.00	
4.Importance	.40	.02	.02	.08	--					.20**	.21	.03
5.Difficulty	.33	-.11	-.34	.08	.35	--				.02	.02	
6.Threat	.67	-.21	-.26	.20	.36	.23	--			.40***	.32	.06
7.Challenge	.47	.06	-.08	.09	.55	.47	.40	--		.04	.04	
8.Emotionality	.66	-.12	-.19	.27	.28	.16	.63	.34	--	.17***	.33	.06
												R^2=.61
											Adj	R^2=.56
												R=.78

$F(8,80)=15.18$, $p<.001$

After the Second Test (n=88)

Variable	DV	1	2	3	4	5	6	7	8	b	B	sr^2
1.WRAT	-.12	--								-.00	-.02	
2.Test Two	-.08	.59	--							-.04	-.11	
3.TAI	.26	-.11	-.10	--						-.00	-.04	
4.Importance	.25	.04	.20	.07	--					.00	.00	
5.Difficulty	.45	-.11	-.24	.19	.24	--				.01	.01	
6.Threat	.67	-.05	-.02	.29	.26	.53	--			.42***	.35	.06
7.Challenge	.41	.06	.17	.14	.51	.46	.27	--		.13	.16	
8.Emotionality	.71	-.07	.01	.32	.18	.31	.56	.31	--	.20***	.47	.13
												R^2=.67
											Adj	R^2=.63
												R=.82

$F(8,79)=19.64$, $p<.001$

*p<.05. **p<.01. ***p<.001

Table 7

Standard Multiple Regressions on Stress
for Group 10-5 in Experiment 1

After the First Test (n=89)

Variable	DV	1	2	3	4	5	6	7	8	b	B	sr^2
1.WRAT	-.34	--								-.03	-.12	
2.Test One	-.26	.57	--							.03	.08	
3.TAI	.45	-.28	-.27	--						.00	.00	
4.Importance	.09	.19	.04	-.05	--					.00	.00	
5.Difficulty	.39	-.42	-.31	.27	-.16	--				-.01	-.01	
6.Threat	.73	-.31	-.32	.39	.15	.38	--			.43**	.38	.09
7.Challenge	.37	-.18	-.14	.07	.16	.29	.27	--		.10*	.14	.02
8.Emotionality	.75	-.26	-.26	.53	.15	.39	.65	.32	--	.19***	.47	.10
												R^2=.69
												Adj R^2=.66
												R=.83

$F(8,80)=22.02$, $p<.001$

Before the Second Test (n=89)

Variable	DV	1	2	3	4	5	6	7	8	b	B	sr^2
1.WRAT	-.32	--								-.01	-.03	
2.Test One	-.26	.56	--							.04	.09	
3.TAI	.55	-.29	-.29	--						.02	.14	
4.Importance	.04	.13	.10	-.10	--					.02	.03	
5.Difficulty	.49	-.26	-.16	.13	-.01	--				.29***	.32	.08
6.Threat	.66	-.24	-.32	.42	.07	.30	--			.15	.14	
7.Challenge	.26	-.13	-.06	.16	.25	.17	.17	--		.03	.04	
8.Emotionality	.77	-.35	-.42	.51	.03	.24	.69	.22	--	.20***	.54	.13
												R^2=.71
												Adj R^2=.68
												R=.84

$F(8,80)=24.13$, $p<.001$

After the Second Test (n=89)

Variable	DV	1	2	3	4	5	6	7	8	b	B	sr^2
1.WRAT	-.32	--								-.08*	-.29	.03
2.Test Two	-.20	.77	--							.07	.22	
3.TAI	.26	-.26	-.22	--						-.01	-.06	
4.Importance	.27	.05	.28	-.02	--					-.02	-.02	
5.Difficulty	.36	-.27	-.37	.12	.02	--				.10	.11	
6.Threat	.55	-.20	-.17	.33	.28	.22	--			.21	.18	
7.Challenge	.28	-.12	-.13	.01	.28	.24	.23	--		.09	.11	
8.Emotionality	.68	-.33	-.27	.46	.30	.37	.60	.19	--	.22***	.52	.12
												R^2=.58
												Adj R^2=.54
												R=.76

$F(8,80)=13.73$, $p<.001$

*p<.05. **p<.01. ***p<.001

perceived difficulty, WRAT math subtest, the TAI, and (after time 1) performance on the previous math test as the independent variables. A significant amount of variance in threat could be accounted for on all regressions (see Tables 5, 8, and 9). Results indicated that between about 33% and 55% of the variance in threat could be explained. As was the case with stress, a large proportion, between 24% and 49% of the total variance, was explained by shared variance. With respect to unique variance, emotionality was related to threat on all but two of the regressions. No other variable consistently made a unique contribution. For threat, correlations larger than about .47 would be considered significant using the conservative F-test. Of particular note are the moderate to high zero-order correlation of uncertainty, conflict/confusion and helplessness with threat and the high intercorrelations among these three independent variables. Emotionality was the only variable that had larger zero-order correlations on any of the regressions. Therefore, it is likely that these three variables accounted for a large proportion of the shared variance.

Challenge. Seven standard multiple regressions were computed with challenge as the dependent variable and emotionality, uncertainty, conflict/confusion, helplessness, control, confidence, importance, perceived difficulty, WRAT math subtest, the TAI,

Table 8

Standard Multiple Regressions on Threat
for Group 5-10 in Experiment 1

After the First Test (n=87)

	DV	1	2	3	4	5	6	7	8	9	10	11	b	B	sr^2
1.WRAT	-.11	--											.01	.02	
2.Test One	-.20	.59	--										-.02	-.06	
3.TAI	.17	-.14	-.08	--									-.00	-.03	
4.Importance	.31	.11	.15	.04	--								.14	.17	
5.Difficulty	.15	-.14	-.34	.08	.17	--							-.10	-.09	
6.Uncertainty	.46	-.26	-.43	.27	.15	.22	--						-.04	-.05	
7.Conflict	.62	-.24	-.35	.26	.25	.32	.64	--					.26*	.27	.03
8.Helpless.	.58	-.28	-.43	.24	.10	.27	.67	.71	--				.26*	.33	.04
9.Control	-.15	.28	.30	-.05	.17	-.22	-.32	-.28	-.45	--			.04	.05	
10.Confidence	-.36	.22	.25	-.02	-.14	-.33	-.40	-.49	-.41	.36	--		-.03	-.04	
11.Emotionality	.54	-.09	-.08	.36	.33	.09	.49	.57	.50	-.12	-.43	--	.08	.20	
															R^2=.51
															Adj R^2=.44
															R=.72

F(11,75)=7.14, p<.001

Before the Second Test (n=89)

	DV	1	2	3	4	5	6	7	8	9	10	11	b	B	sr^2
1.WRAT	-.21	--											-.03	-.10	
2.Test One	-.06	.60	--										.04	.13	
3.TAI	.20	-.10	-.09	--									-.01	-.05	
4.Importance	.36	.02	.02	.08	--								.13	.17	
5.Difficulty	.23	-.11	-.34	.08	.35	--							-.03	-.03	
6.Uncertainty	.53	-.27	-.50	.27	.28	.34	--						.09	.13	
7.Conflict	.62	-.13	-.35	.29	.28	.28	.71	--					.10	.13	
8.Helpless.	.54	-.31	-.49	.32	.16	.34	.60	.65	--				.14	.21	
9.Control	-.28	.46	.26	-.17	.02	.00	-.29	-.29	-.25	--			-.04	-.05	
10.Confidence	-.44	.30	.40	-.27	-.08	-.37	-.59	-.57	-.50	.42	--		-.02	-.03	
11.Emotionality	.63	-.12	-.19	.27	.28	.16	.50	.63	.42	-.26	-.49	--	.15***	.35	.07
															R^2=.53
															Adj R^2=.46
															R=.73

F(11,77)=7.75, p<.001

After the Second Test (n=88)

	DV	1	2	3	4	5	6	7	8	9	10	11	b	B	sr^2
1.WRAT	-.05	--											.01	.03	
2.Test Two	-.02	.59	--										.04	.14	
3.TAI	.29	-.11	-.10	--									.00	.00	
4.Importance	.26	.04	.20	.07	--								.06	.09	
5.Difficulty	.53	-.11	-.24	.19	.24	--							.21*	.22	.03
6.Uncertainty	.60	-.21	-.30	.43	.07	.47	--						.15	.23	
7.Conflict	.67	-.12	-.10	.28	.21	.52	.70	--					.15	.20	
8.Helpless.	.53	-.30	-.31	.33	.01	.45	.64	.69	--				.08	.12	
9.Control	-.17	.26	.39	-.08	.14	-.24	-.36	-.24	-.29	--			.00	.00	
10.Confidence	-.30	.26	.29	-.18	-.10	-.16	-.43	-.35	-.27	.42	--		-.01	-.01	
11.Emotionality	.56	-.07	.01	.32	.18	.31	.45	.55	.39	-.15	-.40	--	.08*	.23	.03
															R^2=.61
															Adj R^2=.55
															R=.78

F(11,76)=10.73, p<.001

*p<.05. **p<.01. ***p<.001

Table 9

Standard Multiple Regressions on Threat
for Group 10-5 in Experiment 1

After the First (n=89)

	DV	1	2	3	4	5	6	7	8	9	10	11	b	B	sr^2
1.WRAT	-.31	--											.01	.06	
2.Test One	-.32	.57	--										-.03	-.08	
3.TAI	.39	-.28	-.27	--									.00	.02	
4.Importance	.15	.19	.04	-.05	--								.07	.10	
5.Difficulty	.38	-.42	-.31	.27	-.16	--							-.02	-.03	
6.Uncertainty	.44	-.37	-.19	.27	-.17	.42	--						.06	.09	
7.Conflict	.59	-.41	-.31	.49	-.02	.48	.52	--					.15	.18	
8.Helpless.	.59	-.40	-.18	.39	.03	.51	.58	.58	--				.17*	.26	.03
9.Control	-.35	.43	.34	-.25	.07	-.39	-.28	-.35	-.49	--			-.01	-.02	
10.Confidence	-.45	.41	.38	-.35	.15	-.45	-.37	-.45	-.44	.54	--		-.10	-.13	
11.Emotionality	.65	-.26	-.26	.53	.15	.39	.44	.71	.53	-.16	-.34	--	.07	.21	
															R^2=.49
															Adj R^2=.42
															R=.70

F(11,77)=6.73, p<.001

Before the Second Test (n=90)

	DV	1	2	3	4	5	6	7	8	9	10	11	b	B	sr^2
1.WRAT	-.24	--											.04	.14	
2.Test One	-.32	.56	--										-.00	-.01	
3.TAI	.42	-.29	-.29	--									.01	.04	
4.Importance	.07	.13	.10	-.10	--								.07	.09	
5.Difficulty	.30	-.26	-.16	.13	-.01	--							.06	.07	
6.Uncertainty	.50	-.40	-.29	.48	-.20	.52	--						.01	.01	
7.Conflict	.62	-.40	-.33	.42	-.07	.33	.73	--					.17	.21	
8.Helpless.	.42	-.38	-.36	.33	-.25	.40	.61	.54	--				.00	.00	
9.Control	-.28	.40	.27	-.31	.26	-.18	-.37	-.31	-.46	--			-.08	-.12	
10.Confidence	-.41	.46	.49	-.44	.18	-.40	-.59	-.41	-.41	.43	--		-.11	-.12	
11.Emotionality	.69	-.35	-.42	.51	.03	.24	.56	.70	.49	-.18	-.40	--	.16**	.47	.10
															R^2=.54
															Adj R^2=.48
															R=.74

F(11,78)=8.45, p<.001

After the Second Test (n=90)

	DV	1	2	3	4	5	6	7	8	9	10	11	b	B	sr^2
1.WRAT	-.20	--											.02	.09	
2.Test Two	-.17	.77	--										-.00	-.01	
3.TAI	.33	-.26	-.22	--									.01	.07	
4.Importance	.28	.05	.28	-.02	--								.10	.14	
5.Difficulty	.22	-.27	-.37	.12	.02	--							.00	.00	
6.Uncertainty	.34	-.42	-.38	.16	.10	.53	--						.03	.04	
7.Conflict	.52	-.46	-.45	.42	.15	.37	.57	--					.12	.17	
8.Helpless.	.26	-.42	-.44	.24	-.10	.38	.43	.48	--				.07	.11	
9.Control	-.10	.30	.26	-.30	.08	-.22	-.33	-.21	-.48	--			.06	.10	
10.Confidence	-.22	.32	.37	-.34	.15	-.32	-.40	-.37	-.21	.44	--		-.02	-.03	
11.Emotionality	.60	-.33	-.27	.46	.30	.37	.44	.61	.28	-.21	-.38	--	.15**	.41	.08
															R^2=.44
															Adj R^2=.36
															R=.67

F(11,77)=5.57, p<.001

*p<.05. **p<.01. ***p<.001

and (after time 1) performance on the previous math test as the independent variables. In general, a smaller proportion of the variance in challenge could be accounted for on the regressions (see Tables 5, 10 and 11). Results indicated that one regression was not significantly different from zero, while on the others only between about 15% and 38% of the variance could be explained. Again, a large proportion of the explained variance was shared variance, indicating a considerable overlap among the variables in the regression. For challenge, correlations larger than about .47 would be considered significant using the conservative F-test. An examination of the zero-order correlations indicated that, contrary to theory, neither control nor confidence were consistently related to challenge. Importance made significant unique contributions on five and difficulty on four regressions, but their zero-order correlations with challenge tended to be low to moderate. Contrary to prediction, emotionality did not make a unique contribution to any of the regressions and had low to moderate zero-order correlations with challenge.

Discussion

According to theory, a stressful situation is one that taxes or exceeds the individual's ability to cope. The person must evaluate the demands of the task in relation to his or her coping abilities. Overall, a significant proportion of stress and threat could be accounted for by the variables in the model. However, a smaller

Table 10

Standard Multiple Regressions on Challenge
for Group 5-10 in Experiment 1

After the First Test (n=86)

	DV	1	2	3	4	5	6	7	8	9	10	11	b	B	sr^2
1.WRAT	.15	--											.05	.13	
2.Test One	.05	.59	--										.02	.05	
3.TAI	.02	-.14	-.08	--									-.01	-.09	
4.Importance	.52	.11	.15	.04	--								.47***	.44	.15
5.Difficulty	.29	-.14	-.34	.08	.17	--							.36**	.27	.05
6.Uncertainty	.34	-.26	-.43	.27	.15	.22	--						.50***	.45	.09
7.Conflict	.21	-.24	-.35	.26	.25	.32	.64	--					-.08	-.07	
8.Helpless.	.12	-.28	-.43	.24	.10	.27	.67	.71	--				-.19	-.19	
9.Control	.00	.28	.30	-.05	.17	-.22	-.32	-.28	-.45	--			-.10	-.10	
10.Confidence	-.07	.22	.25	-.02	-.14	-.33	-.40	-.49	-.41	.36	--		.19	.18	
11.Emotionality	.25	-.09	-.08	.36	.33	.09	.49	.57	.50	-.12	-.43	--	.06	.12	

R^2=.46
Adj R^2=.38
F(11,74)=5.77, p<.001
R=.68

Before the Second Test (n=89)

	DV	1	2	3	4	5	6	7	8	9	10	11	b	B	sr^2
1.WRAT	.06	--											.04	.10	
2.Test One	-.08	.60	--										-.02	-.04	
3.TAI	.09	-.10	-.09	--									-.00	-.01	
4.Importance	.55	.02	.02	.08	--								.34***	.32	.08
5.Difficulty	.47	-.11	-.34	.08	.35	--							.48***	.38	.10
6.Uncertainty	.32	-.27	-.50	.27	.28	.34	--						.02	.02	
7.Conflict	.30	-.13	-.35	.29	.28	.28	.71	--					-.01	-.01	
8.Helpless.	.19	-.31	-.49	.32	.16	.34	.60	.65	--				-.03	-.03	
9.Control	.02	.46	.26	-.17	.02	.00	-.29	-.29	-.25	--			-.02	-.02	
10.Confidence	-.25	.30	.40	-.27	-.08	-.37	-.59	-.57	-.50	.42	--		-.02	-.02	
11.Emotionality	.34	-.12	-.19	.27	.28	.16	.50	.63	.42	-.26	-.49	--	.11	.20	

R^2=.44
Adj R^2=.35
F(11,77)=5.38, p<.001
R=.66

After the Second Test (n=88)

	DV	1	2	3	4	5	6	7	8	9	10	11	b	B	sr^2
1.WRAT	.06	--											.00	.00	
2.Test Two	.17	.59	--										.08	.16	
3.TAI	.14	-.11	-.10	--									-.00	-.03	
4.Importance	.51	.04	.20	.07	--								.34***	.35	.10
5.Difficulty	.46	-.11	-.24	.19	.24	--							.54***	.36	.08
6.Uncertainty	.29	-.21	-.30	.43	.07	.47	--						.25	.23	
7.Conflict	.32	-.12	-.10	.28	.21	.52	.70	--					-.06	-.05	
8.Helpless.	.12	-.30	-.31	.33	.01	.45	.64	.69	--				-.13	-.13	
9.Control	-.02	.26	.39	-.08	.14	-.24	-.36	-.24	-.29	--			-.02	-.02	
10.Confidence	-.17	.26	.29	-.18	-.10	-.16	-.43	-.35	-.27	.42	--		.00	.00	
11.Emotionality	.31	-.07	.01	.32	.18	.31	.45	.55	.39	-.15	-.40	--	.08	.15	

R^2=.45
Adj R^2=.37
F(11,76)=5.69, p<.001
R=.67

*p<.05. **p<.01. ***p<.001

Table 11

Standard Multiple Regressions on Challenge for Group 10-5 in Experiment 1

After the First Test (n=89)

	DV	1	2	3	4	5	6	7	8	9	10	11	b	B	sr^2
1.WRAT	-.18	--											.01	.01	
2.Test One	-.14	.57	--										-.04	-.08	
3.TAI	.07	-.28	-.27	--									-.03	-.20	
4.Importance	.16	.19	.04	-.05	--								.18	.16	
5.Difficulty	.29	-.42	-.31	.27	-.16	--							.10	.08	
6.Uncertainty	.34	-.37	-.19	.27	-.17	.42	--						.13	.12	
7.Conflict	.27	-.41	-.31	.49	-.02	.48	.52	--					-.06	-.05	
8.Helpless.	.47	-.40	-.18	.39	.03	.51	.58	.58	--				.41**	.39	.06
9.Control	-.22	.43	.34	-.25	.07	-.39	-.28	-.35	-.49	--			.02	.02	
10.Confidence	-.21	.41	.38	-.35	.15	-.45	-.37	-.45	-.44	.54	--		.00	.00	
11.Emotionality	.32	-.26	-.26	.53	.15	.39	.44	.71	.53	-.16	-.34	--	.09	.15	

R^2=.33
Adj R^2=.24
$F(11,77)=3.47$, $p<.001$
R=.58

Before the Second Test (n=90)

	DV	1	2	3	4	5	6	7	8	9	10	11	b	B	sr^2
1.WRAT	-.13	--											-.04	-.12	
2.Test One	-.06	.56	--										.01	.02	
3.TAI	.16	-.29	-.29	--									.02	.13	
4.Importance	.25	.13	.10	-.10	--								.24	.23	
5.Difficulty	.17	-.26	-.16	.13	-.01	--							.18	.16	
6.Uncertainty	.13	-.40	-.29	.48	-.20	.52	--						.09	.09	
7.Conflict	.11	-.40	-.33	.42	-.07	.33	.73	--					-.13	-.12	
8.Helpless.	.06	-.38	-.36	.33	-.25	.40	.61	.54	--				-.05	-.04	
9.Control	.06	.40	.27	-.311	.26	-.18	-.37	-.31	-.46	--			.04	.05	
10.Confidence	-.01	.46	.49	-.44	.18	-.40	-.59	-.41	-.41	.43	--		.20	.17	
11.Emotionality	.22	-.35	-.42	.51	.03	.24	.56	.70	.49	-.18	-.40	--	.10	.21	

R^2=.17
Adj R^2=.05
$F(11,78)=1.42$, $p>.05$
R=.41

After the Second Test (n=89)

	DV	1	2	3	4	5	6	7	8	9	10	11	b	B	sr^2
1.WRAT	-.12	--											.03	.10	
2.Test Two	-.13	.77	--										-.10	-.28	
3.TAI	.01	-.26	-.22	--									.01	.07	
4.Importance	.28	.05	.28	-.02	--								.28*	.29	.05
5.Difficulty	.24	-.27	-.37	.12	.02	--							.13	.12	
6.Uncertainty	.26	-.42	-.38	.16	.10	.53	--						.28	.28	
7.Conflict	.14	-.46	-.45	.42	.15	.37	.57	--					-.18	-.18	
8.Helpless.	.09	-.42	-.44	.24	-.10	.38	.43	.48	--				.04	.04	
9.Control	.11	.30	.26	-.30	.08	-.22	-.33	-.21	-.48	--			.14	.18	
10.Confidence	.12	.32	.37	-.34	.15	-.32	-.40	-.37	-.21	.44	--		.25	.24	
11.Emotionality	.19	-.33	-.27	.46	.30	.37	.44	.61	.28	-.21	-.38	--	.06	.12	

R^2=.26
Adj R^2=.15
$F(11,77)=2.42$, $p<.01$
R=.51

*p<.05. **p<.01. ***p<.001

proportion of variance in challenge was explained, which could present some difficulties for the model.

Consistent with the theory, a large proportion of the variance in stress was related to shared variance, indicating considerable overlap in the variables in the model. However, also consistent with the theory, threat and emotionality almost always made a unique contribution to the explanation of variance in stress. Challenge, on the other hand, rarely made a unique contribution and was at best moderately correlated with stress. Ability (as reflected by past performance), test anxiety, perceived task difficulty and importance also tended not to play a part in explaining individual differences in stress.

Almost all of the variance explained in threat was related to shared variance. Although uncertainty, conflict/confusion, and helplessness did not make significant unique contributions, the nature of the relationships among these variables and with threat indicates that they were largely responsible for the shared variance. Emotionality was consistently related to threat. However, contrary to expectations, neither importance nor perceived difficulty made significant contributions to the explanation of threat. Finally, test anxiety, past performance and degree of control were not significantly related to threat.

A considerable proportion of the explained variance in challenge was also related to shared variance. Importance and perceived task

difficulty were the only variables that made relatively stable contributions to the explanation of challenge. Contrary to expectations, neither control nor confidence in ability was correlated with challenge.

Problem-focused coping. Four standard regressions were computed with problem-focused coping as the dependent measure and pretest degree of uncertainty, degree of conflict/confusion, degree of helplessness, amount of control and confidence, perceived level of difficulty and importance, emotionality, posttest CIQ, WRAT math test, and the TAI as the independent variables. The score on the first test was included as an independent variable in the regressions relevant to the second math test. Of the four regressions computed, only one was significantly different from zero, indicating that, for the most part, the variables were not adequate predictors of problem-focused coping (see Tables 12 and 13). On the one regression that was significant, only about 14% of the variance could be explained and no variables made a unique contribution.

Emotion-focused coping. Four standard regressions were computed with emotion-focused coping as the dependent measure and pretest degree of uncertainty, degree of conflict/confusion, degree of helplessness, amount of control and confidence, perceived level of

Table 12

Standard Multiple Regressions on Problem-Focused Coping for Group 5-10 in Experiment 1

After the First Test (n=81)

	DV	1	2	3	4	5	6	7	8	9	10	11	b	B	sr^2
1.WRAT	.18	--											.20	.19	
2.TAI	.04	-.12	--										.01	.02	
3.CIQ	.03	-.21	.34	--									.02	.03	
4.Importance	.24	-.07	.05	.14	--								.69	.21	
5.Difficulty	.02	-.23	.02	.15	.21	--							.16	.05	
6.Uncertainty	-.02	-.32	.30	.41	.14	.41	--						.06	.02	
7.Conflict	-.03	-.31	.34	.47	.06	.18	.52	--					.26	.07	
8.Helpless.	-.11	-.21	.27	.49	.09	.36	.56	.64	--				-.29	-.11	
9.Control	.30	.24	-.13	-.20	.04	-.12	-.36	-.38	-.50	--			.75	.27	
10.Confidence	.07	.29	-.18	-.31	-.18	-.28	-.56	-.50	-.52	.52	--		-.04	-.01	
11.Emotionality	.14	-.18	.38	.40	.18	.10	.46	.44	.37	-.13	-.38	--	.22	.14	

R^2=.19
Adj R^2=.07
F(11,74)=1.60, p>.05
R=.44

After the Second Test (n=88)

	DV	1	2	3	4	5	6	7	8	9	10	11	b	B	sr^2
1.WRAT	.11	--											.11	.10	
2.TAI	.07	-.10	--										-.04	-.09	
3.CIQ	.24	-.10	.37	--									.17	.23	
4.Importance	.23	.02	.08	.08	--								.31	.11	
5.Difficulty	.24	-.11	.08	.20	.35	--							.68	.19	
6.Uncertainty	.12	-.27	.27	.38	.28	.34	--						.09	.03	
7.Conflict	.11	-.13	.29	.36	.27	.28	.71	--					-.12	-.04	
8.Helpless.	.03	-.31	.32	.27	.16	.34	.60	.65	--				-.21	-.08	
9.Control	.07	.46	-.17	-.11	.02	.00	-.29	-.29	-.25	--			.22	.08	
10.Confidence	-.11	.30	-.27	-.28	-.08	-.37	-.59	-.57	-.50	.42	--		-.14	-.05	
11.Emotionality	.22	-.12	.27	.36	.28	.16	.50	.63	.42	-.26	-.49	--	.24	.15	

R^2=.18
Adj R^2=.06
F(11,75)=1.49, p>.05
R=.42

*p<.05. **p<.01. ***p<.001

Table 13

Standard Multiple Regressions on Problem-Focused Coping for Group 10-5 in Experiment 1

After the First Test (n=81)

	DV	1	2	3	4	5	6	7	8	9	10	11	b	B	sr^2
1.WRAT	.04	--											.05	.05	
2.TAI	.12	-.27	--										-.04	-.09	
3.CIQ	.12	-.42	.42	--									.11	.14	
4.Importance	.14	.04	.19	.17	--								.28	.09	
5.Difficulty	-.02	-.19	.08	.18	-.07	--							-.20	-.05	
6.Uncertainty	.06	-.28	.32	.40	.01	.42	--						-.02	-.01	
7.Conflict	-.06	-.41	.43	.53	.11	.39	.60	--					-1.29	-.38	
8.Helpless.	.02	-.36	.41	.29	-.06	.40	.60	.68	--				.35	.13	
9.Control	.10	.37	-.35	-.22	-.21	-.08	-.37	-.47	-.41	--			.34	.12	
10.Confidence	-.10	.32	-.40	-.30	.05	-.14	-.60	-.47	-.51	.38	--		-.46	-.13	
11.Emotionality	.29	-.24	-.62	.45	.30	.30	.44	.54	.43	-.25	-.37	--	.52	.41	

R^2=.19
Adj R^2=.06
F(11,69)=1.48, p>.05
R=.44

After the Second Test (n=88)

	DV	1	2	3	4	5	6	7	8	9	10	11	b	B	sr^2
1.WRAT	.03	--											.11	.12	
2.TAI	.25	-.29	--										.05	.13	
3.CIQ	.35	-.40	.38	--									.12	.21	
4.Importance	.22	.13	-.10	.13	--								.32	.12	
5.Difficulty	.08	-.26	.13	.11	-.01	--							.15	.05	
6.Uncertainty	.13	-.40	.48	.38	-.20	.52	--						.49	.18	
7.Conflict	.19	-.40	.42	.43	-.07	.33	.73	--					-.31	-.11	
8.Helpless.	.00	-.38	.33	.14	-.25	.40	.61	.54	--				-.31	-.11	
9.Control	.16	.40	-.31	-.17	.26	-.18	-.37	-.31	-.46	--			.30	.14	
10.Confidence	-.05	.46	-.44	-.29	.18	-.40	-.59	-.41	-.41	.44	--		.32	.10	
11.Emotionality	.36	-.35	.51	.53	.03	.24	.56	.70	.49	-.18	-.40	--	.35	.29	

R^2=.25
Adj R^2=.14
F(11,76)=2.35, p<.05
R=.50

*p<.05. **p<.01. ***p<.001

difficulty and importance, emotionality, posttest CIQ and problem-focused coping, WRAT math test, and the TAI as the independent variables. The score on the first test was included as an independent variable in the regressions relevant to the second math test. Between 50% and 67% of the variance in emotion-focused coping could be explained by the independent variables, about half of which was related to shared variance (see Tables 14 and 15). Problem-focused coping made significant unique contributions on all regressions, while level of off-task thoughts made significant unique contributions on all but one. Both problem-focused coping and off-task thoughts were positively correlated with emotion-focused coping. For emotion-focused coping, correlations larger than about .5 would be considered significant using the conservative F-test. Although emotionality made a unique contribution on only one of the regressions, it also was moderately and positively correlated with emotion-focused coping on two of the other regressions. The relationship between importance and emotion-focused coping for group 5-10 was puzzling. Importance was significantly negatively related to emotion-focused coping on both regressions with this group. However, an examination of the zero-order correlations with emotion-focused coping indicated that neither of these correlations was significant. This pattern suggests that importance is acting as a suppressor variable. According to Tabachnick and Fidell (1983), a suppressor variable, through its relationship

Table 14

Standard Multiple Regressions on Emotion-Focused Coping for Group 5-10 in Experiment 1

After the First Test (n=86)

	DV	1	2	3	4	5	6	7	8	9	10	11	12	b	B	sr^2
1.WRAT	-.07	--												-.12	-.05	
2.TAI	.32	-.12	--											.07	.07	
3 Prob.	.57	.18	.04	--										1.18***	.56	.25
4.CIQ	.41	-.21	.34	.03	--									.31**	.22	.03
5.Importance	.02	-.07	.05	.24	.14	--								-1.69**	-.24	.05
6.Difficulty	.05	-.23	.02	.02	.15	.21	--							-.07	-.01	
7.Uncertainty	.27	-.32	.30	-.02	.41	.14	.41	--						-.21	-.03	
8.Conflict	.33	-.31	.34	-.03	.47	.06	.18	.52	--					.60	.07	
9.Helpless.	.21	-.21	.27	-.11	.49	.09	.36	.56	.64	--				.03	.01	
10.Control	.08	.24	-.13	.30	-.20	.04	-.12	-.36	-.38	-.50	--			.59	.10	
11.Confidence	-.20	.29	-.18	.07	-.31	-.18	-.28	-.56	-.50	-.52	.52	--		-.56	-.08	
12.Emotionality	.41	.14	-.18	.38	.14	.40	.18	.10	.46	.44	.37	-.13	--	1.16***	.36	.08

R^2=.67
Adj R^2=.61
F(12,73)=12.16, p<.001
R=.82

After the Second Test (n=88)

	DV	1	2	3	4	5	6	7	8	9	10	11	12	b	B	sr^2
1.WRAT	.02	--												.28	.13	
2.TAI	.31	-.10	--											.11	.11	
3.Problem.	.52	.11	.07	--										.90***	.45	.17
4.CIQ	.46	-.10	.37	.24	--									.28	.18	
5.Importance	-.08	.02	.08	.23	.08	--								-1.66**	-.29	.06
6.Difficulty	.19	-.11	.08	.24	.20	.35	--							.31	.05	
7.Uncertainty	.32	-.27	.27	.12	.38	.28	.34	--						-.08	-.02	
8.Conflict	.40	-.13	.29	.11	.36	.27	.28	.71	--					.59	.11	
9.Helpless.	.34	-.31	.32	.03	.27	.16	.34	.60	.65	--				.82	.17	
10.Control	-.20	.46	-.17	.07	-.11	.02	.00	-.29	-.29	-.25	--			-.83	-.16	
11.Confidence	-.32	.30	-.27	-.11	-.28	-.08	-.37	-.59	-.57	-.50	.42	--		.29	.05	
12.Emotionality	.43	-.12	.27	.22	.36	.28	.16	.50	.63	.42	-.26	-.49	--	.57	.18	

R^2=.57
Adj R^2=.50
F(12,70)=7.75, p<.001
R=.76

*p<.05. **p<.01. ***p<.001

Table 15

Standard Multiple Regressions on Emotion-Focused Coping
for Group 10-5 in Experiment 1

After the First Test (n=81)

	DV	1	2	3	4	5	6	7	8	9	10	11	12	b	B	sr^2
1.WRAT	-.21	--												-.08	-.03	
2.TAI	.40	-.27	--											.07	.06	
3.Problem.	.69	.04	.12	--										1.37***	.59	.28
4.CIQ	.51	-.42	.42	.12	--									.56***	.32	.06
5.Importance	.29	.04	.19	.14	.17	--								.81	.11	
6.Difficulty	.12	-.19	.08	-.02	.18	-.07	--							.48	.06	
7.Uncertainty	.21	-.28	.32	.06	.40	.01	.42	--						-1.07	-.15	
8.Conflict	.27	-.41	.43	-.06	.53	.11	.39	.60	--					.04	.01	
9.Helpless.	.21	-.36	.41	.02	.29	-.06	.40	.60	.68	--				.09	.01	
10.Control	-.13	.37	-.35	.10	-.22	-.21	-.08	-.37	-.47	-.41	--			-.16	-.03	
11.Confidence	-.28	.32	-.40	-.10	-.30	.05	-.14	-.60	-.47	-.51	.38	--		-.76	-.10	
12.Emotionality	.54	-.24	-.62	.29	.45	.30	.30	.44	.54	.43	-.25	-.37	--	.44	.15	

R^2=.72
Adj R^2=.67
F(12,68)=14.56, p<.001
R=.85

After the Second Test (n=88)

	DV	1	2	3	4	5	6	7	8	9	10	11	12	b	B	sr^2
1.WRAT	-.28	--												-.09	-.04	
2.TAI	.47	-.29	--											.13	.13	
3.Problem.	.62	.03	.24	--										1.26***	.49	.18
4.CIQ	.63	-.40	.38	.35	--									.51***	.33	.06
5.Importance	.15	.13	-.10	.22	.13	--								.63	.09	
6.Difficulty	.12	-.26	.13	.08	.11	-.01	--							-.74	-.10	
7.Uncertainty	.33	-.40	.48	.13	.38	-.20	.52	--						.13	.02	
8.Conflict	.37	-.40	.42	.19	.43	-.07	.33	.73	--					-.10	-.01	
9.Helpless.	.20	-.38	.33	.00	.14	-.25	.40	.61	.54	--				.57	.08	
10.Control	-.10	.40	-.31	.16	-.17	.26	-.18	-.37	-.31	-.46	--			.16	.03	
11.Confidence	-.40	.46	-.44	-.05	-.29	.18	-.40	-.59	-.41	-.41	.44	--		-1.64*	-.21	.02
12.Emotionality	.53	-.35	.51	.36	.53	.03	.24	.56	.70	.49	-.18	-.40	--	-.02	-.01	

R^2=.67
Adj R^2=.61
F(12,72)=12.00, p<.001
R=.82

*p<.05. **p<.01. ***p<.001

with other variables in the model, acts to "suppress" the irrelevant variance in those variables, thereby improving the amount of variance explained.

Discussion

In general, secondary appraisals, test anxiety, past performance and off-task thoughts did not contribute significantly to the explanation of variance in problem-focused coping. In contrast, problem-focused coping and off-task thoughts did explain a significant amount of the variance in emotion-focused coping.

Emotionality. Seven standard multiple regressions were computed with emotionality as the dependent variable and WRAT math test achievement score, TAI, degree of uncertainty, level of conflict/confusion, degree of helplessness, degree of perceived control, level of confidence, level of importance and perceived level of difficulty entered as independent variables.

Between about 34% and 57% of the variance in emotionality could be explained (see Tables 16 to 18), with about 20% to 40% of total variance being related to shared variance. The secondary appraisal of conflict/confusion made significant unique contributions on all but one regression and test anxiety and importance made significant unique contributions on all but two. No other variables consistently made unique contributions. For emotionality, correlations larger than about

Table 16

Standard Multiple Regressions on Emotionality for Experiment 1

Before the First Test
(n=175)

	DV	1	2	3	4	5	6	7	8	9	b	B	sr^2
1.WRAT	-.22	--									-.01	-.02	
2.TAI	.49	-.19	--								.10***	.31	.08
3.Importance	.25	-.01	.10	--							.46***	.20	.04
4.Difficulty	.21	-.21	.03	.09	--						.08	.03	
5.Uncertainty	.44	-.30	.32	.06	.39	--					.33	.15	
6.Conflict	.48	-.36	.39	.08	.27	.56	--				.64**	.26	.03
7.Helpless.	.39	-.29	.34	.01	.36	.58	.66	--			.02	.01	
8.Control	-.20	.30	-.23	-.09	-.10	-.36	-.42	-.45	--		.22	.11	
9.Confidence	-.37	.30	-.28	-.06	-.20	-.58	-.49	-.51	.45	--	-.17	-.07	

R^2=.41
Adj R^2=.38
$F(9,165)=12.51$, $p<.001$
R=.64

*p<.05. **p<.01. ***p<.001

Table 17

Standard Multiple Regressions on Emotionality for Group 5-10 in Experiment 1

After the First Test (n=89)

	DV	1	2	3	4	5	6	7	8	9	10	b	B	sr^2
1.WRAT	-.09	--										.00	.00	
2.Test One	-.08	.59	--									.09	.11	
3.TAI	.36	-.14	-.08	--								.08**	.24	.05
4.Importance	.33	.11	.15	.04	--							.44*	.21	.03
5.Difficulty	.09	-.14	-.34	.08	.17	--						-.41	-.15	
6.Uncertainty	.49	-.26	-.43	.27	.15	.22	--					.30	.14	
7.Conflict	.57	-.24	-.35	.26	.25	.32	.64	--				.48	.20	
8.Helpless.	.50	-.28	-.43	.24	.10	.27	.67	.71	--			.43	.22	
9.Control	-.12	.28	.30	-.05	.17	-.22	-.32	-.28	-.45	--		.13	.07	
10.Confidence	-.43	.22	.25	-.02	-.14	-.33	-.40	-.49	-.41	.36	--	-.56**	-.26	.04

R^2=.54
Adj R^2=.48
F(10,76)=8.81, p<.001
R=.73

Before the Second Test (n=89)

	DV	1	2	3	4	5	6	7	8	9	10	b	B	sr^2
1.WRAT	-.12	--										-.01	-.01	
2.Test One	-.19	.60	--									.01	.01	
3.TAI	.27	-.10	-.09	--								.03	.09	
4.Importance	.28	.02	.02	.08	--							.37*	.20	.03
5.Difficulty	.16	-.11	-.34	.08	.35	--						-.29	-.13	
6.Uncertainty	.50	-.27	-.50	.27	.28	.34	--					-.06	-.03	
7.Conflict	.63	-.13	-.35	.29	.28	.28	.71	--				.70**	.39	.06
8.Helpless.	.42	-.31	-.49	.32	.16	.34	.60	.65	--			.02	.02	
9.Control	-.26	.46	.26	-.17	.02	.00	-.29	-.29	-.25	--		-.04	-.03	
10.Confidence	-.49	.30	.40	-.27	-.08	-.37	-.59	-.57	-.50	.42	--	-.55*	-.29	.04

R^2=.42
Adj R^2=.35
F(10,78)=5.72, p<.001
R=.65

After the Second Test (n=88)

	DV	1	2	3	4	5	6	7	8	9	10	b	B	sr^2
1.WRAT	-.07	--										-.02	-.02	
2.Test Two	.01	.59	--									.08	.08	
3.TAI	.32	-.11	-.10	--								.05	.17	
4.Importance	.18	.04	.20	.07	--							.11	.06	
5.Difficulty	.31	-.11	-.24	.19	.24	--						.05	.02	
6.Uncertainty	.45	-.21	-.30	.43	.07	.47	--					.12	.06	
7.Conflict	.55	-.12	-.10	.28	.21	.52	.70	--				.86**	.40	.05
8.Helpless.	.39	-.30	-.31	.33	.01	.45	.64	.69	--			.07	.04	
9.Control	-.15	.26	.39	-.08	.14	-.24	-.36	-.24	-.29	--		.04	.02	
10.Confidence	-.40	.26	.29	-.18	-.10	-.16	-.43	-.35	-.27	.42	--	-.40	-.22	

R^2=.42
Adj R^2=.34
F(10,77)=5.47, p<.001
R=.64

*p<.05. **p<.01. ***p<.001

Table 18

Standard Multiple Regressions on Emotionality for Group 10-5 in Experiment 1

After the First Test (n=89)

	DV	1	2	3	4	5	6	7	8	9	10	b	B	sr^2
1.WRAT	-.26	--										.01	.02	
2.Test One	-.26	.57	--									-.02	-.03	
3.TAI	.53	-.28	-.27	--								.07**	.23	.04
4.Importance	.15	.19	.04	-.05	--							.40**	.21	.04
5.Difficulty	.39	-.42	-.31	.27	-.16	--						.18	.08	
6.Uncertainty	.44	-.37	-.19	.27	-.17	.42	--					.11	.06	
7.Conflict	.71	-.41	-.31	.49	-.02	.48	.52	--				1.07***	.47	.10
8.Helpless.	.53	-.40	-.18	.39	.03	.51	.58	.58	--			.27	.14	
9.Control	-.16	.43	.34	-.25	.07	-.39	-.28	-.35	-.49	--		.34*	.21	.03
10.Confidence	-.34	.41	.38	-.35	.15	-.45	-.37	-.45	-.44	.54	--	-.15	-.07	
													R^2=.62	
													Adj R^2=.57	
												F(10,78)=12.71, p<.001	R=.79	

Before the Second Test (n=90)

	DV	1	2	3	4	5	6	7	8	9	10	b	B	sr^2
1.WRAT	-.35	--										.03	.04	
2.Test One	-.42	.56	--									-.14	-.14	
3.TAI	.51	-.29	-.29	--								.08**	.24	.04
4.Importance	.03	.13	.10	-.10	--							.26	.12	
5.Difficulty	.24	-.26	-.16	.13	-.01	--						-.22	-.09	
6.Uncertainty	.56	-.40	-.29	.48	-.20	.52	--					.01	.00	
7.Conflict	.70	-.40	-.33	.42	-.07	.33	.73	--				1.08***	.46	.09
8.Helpless.	.49	-.38	-.36	.33	-.25	.40	.61	.54	--			.45	.20	
9.Control	-.18	.40	.27	-.311	.26	-.18	-.37	-.31	-.46	--		.27	.15	
10.Confidence	-.40	.46	.49	-.44	.18	-.40	-.59	-.41	-.41	.43	--	-.31	-.12	
													R^2=.56	
													Adj R^2=.50	
												F(10,79)=9.95, p<.001	R=.75	

After the Second Test (n=89)

	DV	1	2	3	4	5	6	7	8	9	10	b	B	sr^2
1.WRAT	-.33	--										-.02	-.04	
2.Test Two	-.27	.77	--									.04	.05	
3.TAI	.46	-.26	-.22	--								.07*	.22	.04
4.Importance	.30	.05	.28	-.02	--							.54**	.27	.05
5.Difficulty	.37	-.27	-.37	.12	.02	--						.34	.16	
6.Uncertainty	.44	-.42	-.38	.16	.10	.53	--					.02	.01	
7.Conflict	.61	-.46	-.45	.42	.15	.37	.57	--				.82***	.40	.07
8.Helpless.	.28	-.42	-.44	.24	-.10	.38	.43	.48	--			.03	.01	
9.Control	-.21	.30	.26	-.30	.08	-.22	-.33	-.21	-.48	--		.02	.02	
10.Confidence	-.38	.32	.37	-.34	.15	-.32	-.40	-.37	-.21	.44	--	-.28	-.13	
													R^2=.55	
													Adj R^2=.49	
												F(10,78)=9.46, p<.001	R=.74	

*p<.05. **p<.01. ***p<.001

.45 would be considered significant using the conservative F-test. Uncertainty and helplessness tended to have moderate to high positive correlations with emotionality and conflict, indicating that these variables also made contributions to the shared variance component.

Off-task thoughts. To determine the contribution of secondary appraisals, emotionality, perceived level of importance and difficulty, past performance and test anxiety to individual differences in the level of off-task thoughts experienced, four standard multiple regressions were computed with WRAT math test achievement score, TAI, and pretest measures degree of uncertainty, level of conflict/confusion, degree of helplessness, degree of perceived control, level of confidence, emotionality, level of importance and perceived level of difficulty entered as independent variables.

Results indicated that between about 19% and 34% of the variance in off-task thoughts could be explained (see Tables 19 and 20). As was the case with other variables, most of the explained variance was related to shared variance. For off-task thoughts, zero-order correlations larger than about .45 would be considered significant using the conservative F-test. An examination of the zero-order correlations indicated that the secondary appraisals of conflict/confusion and emotionality tended to have highest correlations with off-task thoughts.

Table 19

Standard Multiple Regressions on CIQ
for Group 5-10 in Experiment 1

After the First Test (n=89)

	DV	1	2	3	4	5	6	7	8	9	10	b	B	sr^2
1.WRAT	-.21	--										-.11	-.07	
2.TAI	.34	-.12	--									.08	.12	
3.Importance	.14	-.07	.05	--								.48	.10	
4.Difficulty	.15	-.23	.02	.21	--							-.34	-.07	
5.Uncertainty	.41	-.32	.30	.14	.41	--						.46	.10	
6.Conflict	.47	-.31	.34	.06	.18	.52	--					.80	.15	
7.Helpless.	.49	-.21	.27	.09	.36	.56	.64	--				1.14*	.29	.04
8.Control	-.20	.24	-.13	.04	-.12	-.36	-.38	-.50	--			.28	.07	
9.Confidence	-.31	.29	-.18	-.18	-.28	-.56	-.50	-.52	.52	--		.24	.05	
10.Emotionality	.40	-.18	.38	.18	.10	.46	.44	.37	-.13	-.38	--	.35	.15	

R^2=.34
Adj R^2=.25
F(10,78)=3.97, p<.001 R=.58

After the Second Test (n=89)

	DV	1	2	3	4	5	6	7	8	9	10	b	B	sr^2
1.WRAT	-.10	--										-.16	-.11	
2.TAI	.37	-.10	--									.19**	.30	.08
3.Importance	.08	.02	.08	--								-.29	-.07	
4.Difficulty	.20	-.11	.08	.35	--							.48	.10	
5.Uncertainty	.38	-.27	.27	.28	.34	--						.40	.11	
6.Conflict	.36	-.13	.29	.27	.28	.71	--					.51	.14	
7.Helpless.	.27	-.31	.32	.16	.34	.60	.65	--				-.11	-.09	
8.Control	-.11	.46	-.17	.02	.00	-.29	-.29	-.25	--			.30	.09	
9.Confidence	-.28	.30	-.27	-.08	-.37	-.59	-.57	-.50	.42	--		.35	.09	
10.Emotionality	.36	-.12	.27	.28	.16	.50	.63	.42	-.26	-.49	--	.51	.24	

R^2=.29
Adj R^2=.19
F(10,78)=3.11, p<.005 R=.53

*p<.05. **p<.01. ***p<.001

Table 20

Standard Multiple Regressions on CIQ
for Group 10-5 in Experiment 1

After the First Test (n=86)

	DV	1	2	3	4	5	6	7	8	9	10	b	B	sr^2
1.WRAT	-.42	--										-.39**	-.29	.06
2.TAI	.42	-.27	--									.16*	.25	.03
3.Importance	.17	.04	.19	--								.43	.10	
4.Difficulty	.18	-.19	.08	-.07	--							-.04	-.01	
5.Uncertainty	.40	-.28	.32	.01	.42	--						.73	.17	
6.Conflict	.53	-.41	.43	.11	.39	.60	--					1.43*	.32	.04
7.Helpless.	.29	-.36	.41	-.06	.40	.60	.68	--				-.42	-.13	
8.Control	-.22	.37	-.35	-.21	-.08	-.37	-.47	-.41	--			.51	.13	
9.Confidence	-.30	.32	-.40	.05	-.14	-.60	-.47	-.51	.38	--		.32	.07	
10.Emotionality	.45	-.24	-.62	.30	.30	.44	.54	.43	-.25	-.37	--	.08	.05	

R^2=.40
Adj R^2=.32
F(10,75)=4.93, p<.001
R=.63

After the Second Test (n=90)

	DV	1	2	3	4	5	6	7	8	9	10	b	B	sr^2
1.WRAT	-.40	--										-.44***	-.29	.06
2.TAI	.38	-.29	--									.05	.07	
3.Importance	.13	.13	-.10	--								.55	.12	
4.Difficulty	.11	-.26	.13	-.01	--							-.03	-.01	
5.Uncertainty	.38	-.40	.48	-.20	.52	--						.82	.18	
6.Conflict	.43	-.40	.42	-.07	.33	.73	--					.39	.08	
7.Helpless.	.14	-.38	.33	-.25	.40	.61	.54	--				-1.09	-.23	
8.Control	-.17	.40	-.31	.26	-.18	-.37	-.31	-.46	--			-.30	-.08	
9.Confidence	-.29	.46	-.44	.18	-.40	-.59	-.41	-.41	.44	--		.20	.04	
10.Emotionality	.53	-.35	.51	.03	.24	.56	.70	.49	-.18	-.40	--	.73**	.36	.06

R^2=.41
Adj R^2=.34
F(10,79)=5.52, p<.001
R=.64

*p<.05. **p<.01. ***p<.001

Test performance. Four standard multiple regressions were conducted with test performance as the dependent variable and WRAT math test score, TAI, emotionality, off-task thoughts and level of problem-focused and emotion-focused coping as independent variables.

Between 31% and 64% of the variance in test performance could be explained by the independent variables (see Table 21). A relatively small proportion, about 10% to 40% of the total variance, was related to shared variance. Past performance always made large unique contributions to the explanation of variance in present performance. Problem-focused and emotion-focused coping made significant unique contribution on only one regression, when the five-minute test was written first. Problem-focused coping was positively related, whereas emotion-focused coping was negatively related. Emotionality made a unique contribution on one regression, when there was no zero-order correlation between emotionality and performance, indicating that it was acting as a suppressor variable. An examination of the zero-order correlations indicated that problem-focused and emotion-focused coping were, at best, only weakly related to performance.

Discussion

The amount of conflict/confusion experienced, perceived level of importance and test anxiety were almost always related to the level of emotionality. In turn, emotionality and the secondary appraisal of conflict/confusion explained a significant proportion of the variance

Table 21

Standard Multiple Regressions on Test Performance for Experiment 1

Group 5-10

First Test (n=86)

	DV	1	2	3	4	5	6	b	B	sr^2
1.TAI	-.08	--						.03	.07	
2.WRAT	.62	-.12	--					.50***	.55	.27
3.Problem.	.22	.04	.18	--				.23**	.28	.04
4.EMOT.	-.15	.32	-.07	.57	--			-.12*	-.30	.03
5.CIQ	-.29	.34	-.21	.03	.41	--		-.07	-.13	
6.Emotionality	-.15	.38	-.18	.14	.55	.40	--	.13	.10	

R^2=.46

Adj R^2=.42

F(6,79)=11.17, p<.001 R=.68

Second Test (n=83)

	DV	1	2	3	4	5	6	7	b	B	sr^2
1.TAI	-.10	--							-.01	-.03	
2 Test One	.64	-.09	--						.34***	.47	.13
3.WRAT	.59	-.10	.60	--					.22**	.33	.07
4.Problem.	.09	.07	.12	.11	--				-.02	-.03	
5.EMOT.	-.07	.31	-.16	.00	.52	--			-.01	-.01	
6.CIQ	-.15	.37	-.14	-.10	.24	.46	--		-.05	-.12	
7.Emotionality	.03	.27	-.19	-.12	.22	.43	.36	--	.21*	.23	.04

R^2=.52

Adj R^2=.48

F(7,75)=11.60, p<.001 R=.72

Group 10-5

First Test (n=83)

	DV	1	2	3	4	5	6	b	B	sr^2
1.TAI	-.28	--						-.01	-.02	
2.WRAT	.54	-.27	--					.31***	.50	.20
3.Problem.	-.09	.12	.04	--				-.06	-.09	
4.EMOT.	-.25	.40	-.21	.69	--			.01	.04	
5.CIQ	-.34	.42	-.42	.12	.51	--		-.04	-.09	
6.Emotionality	-.29	.62	-.24	.29	.54	.45	--	-.09	-.12	

R^2=.36

Adj R^2=.31

F(6,76)=7.06, p<.001 R=.60

Second Test (n=85)

	DV	1	2	3	4	5	6	7	b	B	sr^2
1.TAI	-.22	--							.00	.00	
2.Test One	.65	-.29	--						.42***	.32	.06
3.WRAT	.79	-.29	.56	--					.57***	.62	.23
4.Problem.	-.03	.25	-.06	.03	--				.01	.09	
5.EMOT.	-.31	.47	-.36	-.28	.62	--			-.06	-.04	
6.CIQ	-.27	.38	-.36	-.40	.35	.63	--		.09	.06	
7.Emotionality	-.30	.51	-.42	-.35	.36	.53	.53	--	.05	.04	

R^2=.67

Adj R^2=.64

F(7,77)=22.74, p<.001 R=.82

*p<.05. **p<.01. ***p<.001

in off-task thoughts.

Furthermore, a significant amount of the variance in test performance could be accounted for by ability measures. However, contrary to theory and prediction, in only one case, when the five-minute test was given first, did the use of emotion-focused and problem-focused coping strategies contribute significantly to the explanation of variance in test performance. This presents considerable difficulty for the theory.

Discussion

Experiment 1 was designed to simulate the process that students experience while taking a series of tests. When students first encountered the tests, they did not know what to expect. Therefore, to some degree, it was a unique experience. However, they did have an extensive history of taking tests and according to theory, would appraise the situation based on that experience. Furthermore, all students completed the arithmetic subtest of the WRAT, which they could use as a means of appraising the subsequent math test. Analysis of baseline measures revealed that the groups did not differ in past performance or pretest anxiety. The groups were also comparable on overall performance on the math tests. These similarities on baseline measures and overall performance strongly suggest that the person variables related to performance and anxiety were randomly distributed between the groups. Because the groups were similar and confronted with identical situations, there should have been no difference between the two groups in cognitive appraisals before the tests.

For the most part, this was the case. Levels of worry, emotionality, stress, threat and challenge were all comparable between the groups before the tests. However, two relevant variables, perceived level of difficulty and importance, were significantly

different between groups before the tests. This difference, which was contrary to expectations, made it necessary to calculate MANCOVAs to statistically control for these variables. It is not clear what caused this difference, but there are a number of possibilities. One cannot entirely rule out the possibility that this difference occurred by chance. It is also possible that something outside of the experimental situation differentially affected subjects in one of the groups. Even though the experimental environment is controlled, external factors may influence the results. Despite this problem, before the tests the groups were generally comparable on how they appraised the situation.

As predicted, time constraints did affect performance. On test one, the group given five minutes to complete the test earned lower grades, indicating that time constraints make the test more difficult.

Previous research has shown that worry is related to performance (e.g., Deffenbacher, 1980), and emotionality is related to testing cues (e.g., being in the examination room, Deffenbacher, 1980) and, on occasion, performance (Spielberger et al., 1976). If these two variables react in the predicted manner, this finding would lend support to the argument that people are aware of subtle changes in the demands of the task. In the present experiment, limiting the time to complete the test resulted in subjects being more worried and more emotionally aroused. This suggests that subjects were aware of the differences in the demands of the task.

Self-reports of stress and threat were sensitive indicators of differences in the task demands even in a relatively unimportant lab

test. The manipulation of one variable, time to complete the test, affected subjects' levels of stress and threat in a manner consistent with Lazarus' stress and coping theory. Afterwards, subjects who took the more difficult five-minute test reported experiencing more stress and threat than those who took the 10-minute test.

It was also expected that the group that wrote the test in five minutes would feel more challenged after the test and would use more emotion-focused and problem-focused coping strategies. However, contrary to prediction, the groups did not differ on challenge appraisals or in the problem-focused or emotion-focused coping strategies used.

In retrospect, it is not surprising that the groups did not differ in the use of problem-focused coping. Both groups wrote the same test (except for time allowed), which required basic math skills. Although there would be variations within the groups, the groups did not differ on math ability. Therefore, because the task required the same skills, which were comparable across the groups, it is not surprising that problem-focused coping was comparable across groups. However, it is still somewhat surprising that emotion-focused coping was not different. Level of emotionality was higher after the test for subjects who wrote it in five minutes. Therefore, theoretically, these subjects would need to use more emotion-focused coping to deal with this higher level of emotionality.

Although the groups had different experiences, as predicted, there were some reliable interrelationships among primary and

secondary appraisals, emotions, off-task thoughts, and emotion-focused coping. The appraisal process seemed to be similar for both groups on each test.

For example, as predicted, stress was highly related to threat and emotionality for both groups at all times. Furthermore, secondary appraisals, (uncertainty, conflict/confusion, and helplessness) and emotionality were strongly positively related to threat for both groups at all times. Emotionality, in turn, was consistently positively related to conflict/confusion, test anxiety, importance, uncertainty and helplessness. Moreover, off-task thoughts was related to conflict/confusion and emotionality. Finally, emotion-focused coping was consistently positively related to problem-focused coping, off-task thoughts, and emotionality.

Consistent with stress and coping theory, there are many complicated interrelationships between primary and secondary appraisals and emotions. For example, there was not a direct relationship of conflict/confusion and importance with stress and threat, but both conflict/confusion and importance were related to emotionality. Furthermore, the primary appraisals of stress and threat were related to emotionality. These relationships suggest that the relationships of conflict/confusion and importance to stress and threat are mediated by their effect on, or through their relationship with, emotionality. These results also suggest that an individual's awareness and interpretation of physiological arousal is affected by secondary appraisals, in particular how much conflict and confusion is

experienced. This relationship between appraisals of stress and threat and emotionality, and between emotionality and secondary appraisals is consistent with a bidirectional relationship between cognitions and the level of physiological arousal.

Also notable was the relationship between test anxiety and emotionality. It appears that a person's stable characteristics, such as test anxiety, through a small contribution to the awareness and interpretation of physiological arousal, have a small, indirect effect on stress and threat.

Although the positive relationship between off-task thoughts, emotionality and the secondary appraisal of conflict/confusion has been demonstrated with correlational data, it is consistent with stress and coping theory. According to theory, if the subject does not believe that adequate coping strategies are available to be successful (conflict/confusion), he or she will experience more off-task thoughts and will interprete physiological arousal in a negative manner. Inconsistent with previous research, off-task thoughts were not related to test anxiety. In contrast, test anxiety was positively related to emotionality. The present study provides evidence that supports the hypothesized relationship between emotionality and test anxiety. It also provides evidence that these constructs are related to constructs in the stress and coping model.

With regard to the relationship between emotion-focused and problem-focused coping, preliminary analyses indicated that it is the

number of problem-focused coping strategies used (not how often each strategy is used) that is related to increased use of emotion-focused coping. It is possible that individuals who used many problem-focused coping strategies believed that they were not being successful. Given this belief, it is likely that they would experience more physiological arousal, begin to engage in more off-task thoughts, and therefore would need to use more emotion-focused coping strategies. It is also possible that once individuals began to switch problem-focused coping strategies, they become more aware of or more responsive to the emotional cues and negative appraisals and therefore did not maintain the use of successful strategies.

It appears that as the process unfolds and the demands of the task change, the factors that are considered when making appraisals are essentially the same. For example, secondary appraisals appear to change over time in a manner that reflects the changing demands of the task. That is, subjects who have just written the more difficult five-minute test reported more negative secondary appraisals than those who have written the 10-minute test. The level of threat appears to reflect these differences in secondary appraisals. More negative secondary appraisals are related to higher levels of threat, which in turn are related to higher levels of stress. Moreover, the level of emotionality is related to secondary appraisals, and emotionality is related to off-task thoughts, regardless of the demands. When subjects feel uncertain, confused and helpless, their level of arousal is

higher and they experience more off-task thoughts. Furthermore, as subjects' arousal increases and their minds wander, more emotion-focused coping is used.

In contrast, a number of variables did not correlate as expected. For example, importance, perceived difficulty, and past performance were not directly related to stress or threat. Folkman and Lazarus (1985) demonstrated that perceived difficulty was related to threat and importance was related to both threat and challenge. In this experiment, perceived difficulty was not related to threat and importance was only related to challenge. However, Folkman and Lazarus (1985) also report that past performance was not related to threat or challenge.

The secondary appraisals of control and confidence in ability also were not related to any of the variables in the model. Control has been shown to be related to challenge (Folkman & Lazarus, 1985) and problem-focused and emotion-focused coping (Compas et al., 1988; Folkman et al., 1986; Forsythe & Compas, 1977) and was expected to be similarly related in this experiment. Theoretically, confidence in ability is also an important secondary appraisal, but it was not related to other variables in this experiment. Although importance and perceived difficulty were related to challenge, only a small proportion of challenge was explained. The lack of relationship of challenge with other variables in the model is contrary to theory and prediction. However, Folkman and Lazarus (1985) also had some

difficulty with challenge emotions, which they used to represent challenge appraisals.

In general, secondary appraisals, test anxiety, past performance and off-task thoughts did not contribute significantly to the explanation of variance in problem-focused coping. It is possible that problem-focused coping is related to the demands of each question on the test and subjects' inability to judge how successful they are with each question. For example, if students believe that a strategy is useful, they will continue to use it, but if students believe that they are having difficulty, another strategy might be adopted. However, with no direct feedback, students are more likely to continue using the same strategies. Students were not being provided with feedback about their success on each item and appear to be making decisions about the use of problem-focused coping strategies based on factors not related to variables measured in this experiment. For example, students may have a set pattern of problem-focused coping strategies that they generally use, and it may take a great deal of evidence before they change this pattern. It is also possible that these tests require only a limited range of the problem-focused coping strategies available, or require coping strategies not included in the condensed R-WOC.

Finally, neither problem-focused nor emotion-focused coping was related to performance. This presents considerable difficulty for the theory. There are at least two possible reasons to account for the

absence of a relationship between coping and performance. It may be that the demands of a high school math test do not exceed the resources of these university students and do not require the extensive use of coping strategies. The fact that test performance was related to coping strategies only when the subjects encountered a novel task under time constraints, lends some support to this hypothesis. Another possible explanation relates to importance. Because the test was taken in a lab, it was not particularly important for either group. Theoretically (Lazarus & Folkman, 1984), the importance of a test is related to threat and physiological arousal. In this experiment, importance was related to physiological arousal. Thus, a relatively unimportant test should be less threatening and physiologically arousing than a relatively important test. Physiological arousal was not related to performance in this experiment, suggesting that the level of physiological arousal was not high enough to interfere with performance and therefore did not require much emotion-focused coping. However, a test that is important to subjects should produce levels of physiological arousal that could interfere with performance. Therefore, Experiment 3, which examines stress and coping in the context of in-class tests, should demonstrate that emotionality and emotion-focused coping are related to performance.

Some of the results of this experiment are consistent with the theory of stress and coping and with the results of Folkman and

Lazarus (1985). When the students first encounter the tests, the groups make similar appraisals because they have similar information about the tests. However, as time passes and subjects become involved in writing the test, they reappraise the situation based on their experience. Therefore, as the objective demands change, these changes are reflected in differences in the level of stress and threat appraisals reported after the first test. Moreover, regardless of the objective demands, certain appraisals, emotions, and thoughts are related, indicating that subjects in each group are using a similar process to make their appraisals. These results lend support to the hypothesis that cognitive appraisals change to reflect the changing demands of the task and that there is a fairly regular pattern in the process that people use to make these appraisals.

Chapter 6

EXPERIMENT 2

Introduction

The results of Experiment 1 demonstrated that stress and threat appraisals responded to small differences in the level of difficulty of a math test taken in a lab. However, it is also important to test the measures of stress, threat, and challenge used in this thesis in both lab and naturalistic settings. If these measures reflect the cognitive appraisals hypothesized by Lazarus and Folkman (1984), then these measures will react in a similar manner in both settings. Experiment 2 compares students' appraisals of stress, threat and challenge on math tests in a lab setting with those in a naturalistic exam setting.

According to Folkman and Lazarus (1985), individuals will experience more stress, threat, and challenge during events that are appraised as more important and difficult compared to events that are appraised as less important and difficult. The four tests in this experiment can readily be divided into two categories. Christmas and final exams are important events in students' lives and can have a major impact on their academic careers. Furthermore, exams are

designed to test students' mastery of all the material covered in a course. Therefore, Christmas and final exams should be important and difficult events. The two laboratory math tests, on the other hand, had little relevance to students' lives. The tasks had some importance because students could earn a monetary bonus for high achievement, but the importance of the bonus should not match that of major exams. The math tests were taken from a high school achievement test and should have been within the range of competence for most university students. Therefore, it is hypothesized that the students will perceived that the exams will be more difficult and more important than the math tests.

Theoretically, the students should appraise the exams, which are more difficult and more important, as being more stressful, threatening, and challenging than the math tests. To test the effect of importance and difficulty on stress, threat and challenge, the measures obtained before and after the two math tests were compared with the measures obtained before and after the two exams. It was hypothesized that the level of all measures would be significantly higher for the exams than for the tests. Because students knew the results of the tests, the measures taken after the math test correspond to the outcome stage in Folkman and Lazarus (1985). Students did not know the results of the exams when they completed these after measures; therefore, this point in time corresponds to the waiting stage. It was hypothesized that all measures would decline more after the math tests than after the exams.

If the present results are to be consistent with Folkman and Lazarus (1985), all measures should be at their highest before the tests and exams. Moreover, the measures should decrease significantly after the tests but not after the exams, as the measures taken after the exams were obtained before subjects had received their grade.

Method

Subjects

One hundred first year undergraduate students were randomly selected from incoming students at McMaster University. Subjects were recruited to participate in a year long study which examined vulnerability to stress (Lamping 1986a, 1986b, 1987). A total of 16 subjects dropped out over the year, and did not participate in all parts of the study. Subjects ranged in age from 16 to 21 years of age (M=18.63) at the beginning of the experiment and came from all faculties on campus. Subjects were paid to participate and were required to complete questionnaires concerning their thoughts and feelings with respect to a number of natural (first week of classes, Christmas and final exams, and a stressful life event) and simulated (cold pressor test, math test, and public speaking) stressful situations during their first year of university (Lamping, 1986a, 1986b, 1987). For the purposes of the present study only four of the stressful situations will be discussed, two lab-administered math tests and the exams written at the end of the first (Christmas) and second (Final) semester.

Procedure

During the first term, one month apart, subjects completed two

computer-administered math tests, identical to those used in Experiment 1. Before subjects took the math test they were told they could receive up to five dollars as a bonus for good performance. They then completed the CAQ and the state version of the STAI. Subjects were given five minutes to complete the math test and were then given additional questionnaires to complete, including the CAQ, the CIQ, the R-WOC, and the state version of the STAI. The math tests were counterbalanced so that half the subjects took one of the math tests during the first session and half took the other test.

At the end of each semester, students wrote a series of exams for the courses taken during that semester. After the first semester these were the Christmas exams and after the second semester these were the Final exams. As a part of the experiment, subjects completed the questionnaires before they wrote their first exam. The post-exam questionnaires were completed within two days of finishing their last exam. Subjects completed the same questionnaires for the exams as they did for the lab tests.

Results

In this experiment one type of analysis was computed. All hypotheses were tested using planned comparisons, all of which were computed by specifying the appropriate contrast coefficients in the SPSS MANOVA program. This procedure allows for more fine-grained analysis than an omnibus F-test and protects against inflated Type 1 error (Tabachnick & Fidell, 1983). The tests of simple effects were calculated using the Bonferroni procedure. There were two comparisons for each analysis; therefore, to control for type 1 error rate, each comparison testing for simple effects has to be significant beyond the .025 level to keep the overall error rate for the two comparisons below the .05 level. In this experiment all planned contrasts compared the two math tests with the two sets of exams.

Perceived Importance and Difficulty. A one-way (test session; math tests vs. exams) repeated measures MANOVA was computed with perceived importance and difficulty as the dependent measures. Planned comparisons computed for perceived importance and difficulty indicated that students did perceive the exams as more important [F (1,80) = 361.25, $p < .001$] and more difficult [F (1,80)= 104.35, $p < .001$] than the two math tests (see Table 22).

Table 22

Means and Standard Deviations of Self-Report Measures in Experiment 2

Test	Importance	Difficulty	Stress	Threat	Challenge
Lab Test One (N=92)					
Before					
M	3.55	4.00	3.19	1.53	4.57
SD	1.76	1.58	1.78	0.98	1.49
After					
M	3.00	3.12	2.14	1.37	4.21
SD	1.71	1.72	1.53	0.87	1.64
Lab Test Two (N=88)					
Before					
M	3.25	4.00	2.41	1.34	4.38
SD	1.70	1.63	1.43	0.74	1.53
After					
M	3.16	3.35	1.65	1.25	4.03
SD	1.63	1.54	1.02	0.65	1.61
Christmas Exams (N=88)					
Before					
M	6.26	5.46	4.69	2.75	5.81
SD	0.94	1.04	1.53	1.76	1.15
After					
M	5.87	5.11	2.52	2.49	5.35
SD	1.14	1.19	1.64	1.61	1.50
Final Exams (N=84)					
Before					
M	6.56	5.48	4.70	2.99	5.86
SD	0.75	1.07	1.45	1.74	1.04
After					
M	6.10	5.13	2.23	2.28	5.37
SD	1.30	1.32	1.48	1.55	1.36

Stress, Threat and Challenge. The hypotheses concerning the appraisals of stress, threat, and challenge were tested with planned contrasts comparing the two math tests with the two exams (see Table 22 for means and standard deviations). Significant interactions were decomposed to examine for simple effects, such that planned comparisons were computed separately for before and after measures.

A 2 (test session; math tests vs. exams) by 2 (Time; before vs. after) repeated measures MANOVA with repeated measures on both factors was computed with stress, threat, and challenge as the dependent measures. For stress, results indicated a significant effect of test session [F (1,81)= 96.98, p<.001], time [F (5,77)= 182.59, p< .001], and a significant test session x time interaction [F (1,81)= 76.83, p<.001]. Results of planned comparisons of simple effects indicated that stress was significantly higher both before [F (1,81)= 169.23, p< .001] and after [F (1,81)= 10.90, p< .001] the exams than the math tests. Although the level of stress after the exams was significantly higher than after the math tests, the interaction appeared to indicate a greater decrease in stress after the exams than after the tests.

For threat, there was a significant effect of test session [F (1,81)= 88.12, p< .001], time [F (5,77)= 13.66, p< .001], and a significant test session x time interaction [F (1,81)= 6.05, p< .02]. Analyses of the simple effects indicated that there were significant differences both before [F (1,81)= 76.18, p< .001] and after [F (1,81)= 61.59, p< .001] the tests/exams. An examination of the means

revealed that the level of threat was higher in the exams than in the tests and declined more after the exams than after the tests.

For challenge, there was a significant effect of test session [F (1,81)= 61.43, $p< .001$], time [F (5,77)= 19.43, $p< .001$], but no test session x time interaction [F (1,81)= .44, $p> .05$]. It can be concluded that challenge was higher on the exams than on the math tests and declined equally after both the tests and the exams.

Discussion

The results of this experiment support the hypothesis that increased importance and difficulty produced higher levels of stress, threat, and challenge. All measures were significantly higher on exams, which were rated as more important and difficult, than on tests. The difference in importance and difficulty between the tests and the exams supports Lazarus' contention that lab studies cannot adequately replicate the stressfulness of naturalistic settings (Lazarus & Folkman, 1984). In contrast, the pattern of change from before to after did not coincide with Lazarus' predictions. It was predicted that stress, threat and challenge would decline after the tests and not after the exams, but all variables declined as much or more after exams as after tests.

There are several reasons that the changes in stress, threat and challenge did not follow the hypothesized pattern. One important difference between this experiment and that of Folkman and Lazarus (1985) is the different points in time at which the scores were obtained. Folkman and Lazarus obtained their measures two days before the test and then waited until five days after to collect the waiting stage data. It is likely that immediately before taking the exams students would experience more stress, threat and challenge than two

days before or five days after a midterm. Therefore, appraisals of stress, threat and challenge should be at their maximum at this point. Folkman and Lazarus missed this peak and may, therefore, have falsely concluded that primary appraisals of stress, threat and challenge did not decrease from before to after the exam. It is also possible that the increase in appraisals of stress and threat may be due to the relationship of stress and threat with emotionality. Emotionality has been shown to be related to test cues rather than performance, and to peak immediately before a test (Deffenbacher, 1980). It may be that this awareness of physiological arousal produces the peak in stress and threat. This emotionality would decrease after the exam, even though students did not know their grades. There is some evidence from Experiment 1 that supports this hypothesis.

It is also possible that the level of stress, threat and challenge generated by a series of exams is much higher than that produced by the single midterm in the Folkman and Lazarus (1985) study. Again, even though students did not know their grades after the exams, the stress of the week of studying and writing exams would have been over and the students were finished school for the term. This relief from the pressure could also explain the drop in levels of stress, threat and challenge. The relatively low levels of primary appraisals before the math tests also create some difficulty. Because the scores on stress, threat and challenge obtained before the math tests were quite low, there was a limited range for these scores to decrease after the math tests.

The difference between a set of exams and a set of lab tests in the level of importance and difficulty is considerable. The results of Experiment 2 are generally similar to the results of Experiment 1. In both experiments, measures of stress and threat were higher on tasks that were objectively more difficult. However, unlike Experiment 1, challenge also appeared to change as a result of task difficulty.

Naturalistic settings, in this case the university exams, although they provide the opportunity to examine real-life events that are much more stressful than lab tests, do not allow for the control available in the lab. Because the same amount of control is not available in both settings, comparing a lab setting to a naturalistic setting creates some difficulties. However, the large differences that were found in the level of cognitive appraisals indicate that despite these problems, students did perceive exams to be much more stressful, threatening and challenging than lab tests. Although the decline in stress, threat, and challenge after the exams is contrary to the results of Folkman and Lazarus (1985), other results in this experiment generally provide further support for the theoretical relationship of stress and threat with task difficulty and importance, and the use of these measures of stress and threat to represent the constructs in the model. Although it is not possible, or even desirable, to control for the level of perceived difficulty in a naturalistic setting. Because it is a part of the appraisal process, the effect of this variable on others in the model also must be

recognized. For example, Experiment 3 compared a review test, which was designed to cover the work of an entire semester, with other in-class tests that covered the work of only one week. According to theory, before students write the tests, they should be aware that this in-class review test was more difficult and should react accordingly.

Chapter 7

EXPERIMENT 3

Introduction

Experiment 1 demonstrated that subjects who wrote a test in five minutes reported higher levels of stress, threat, worry and emotionality than those who wrote the same test in 10 minutes. Experiment 2 demonstrated that when students wrote exams, compared to when they wrote high school math tests in a lab setting, they reported higher perceived level of difficulty and importance and higher levels of stress, threat, and challenge. To test the hypothesis that test difficulty affects cognitive appraisals, a review test, taken immediately before the Christmas exams, was compared to four other tests taken throughout the year. In contrast to the other tests, which only tested one week's material, the review test covered material for the full term. Because students had to learn material covering the entire term it was hypothesized that the review test would be more difficult than the other tests. Moreover, it was hypothesized that both before and after writing the review test the students would perceive it as being more difficult than the other tests. Furthermore, these students would appraise the review test as being more stressful, threatening, challenging, worrisome and emotionally arousing than the

other tests. It was also hypothesized that stress, threat, challenge, worry, and emotionality would decrease significantly after all the tests because they knew their grades. Furthermore, subjects would report higher levels of emotion-focused coping strategies in the review compared to the other tests. In contrast, there should be no differences in the level of problem-focused coping because all tests were presented in the same format and presumably would not differ, overall, on the problem-focused coping strategies required. Planned contrasts, comparing the review test to the others, were computed to test these hypotheses.

A series of standard multiple regressions also were computed to examine the interrelationship of variables in the model. Measures of ability, subjects' perceptions of the level of difficulty and importance, emotionality, and the TAI were included on the regressions with stress, threat, and challenge as dependent measures, consistent with theory and similar to the analyses in Experiment 1. Because studying is a part of preparation for a test and because it is related to performance, study time, which was not included in Experiment 1, was included in this experiment. Also consistent with theory, for the regressions with stress as the dependent measure, the primary appraisals of threat and challenge were included as independent measures, whereas for the regressions with threat or challenge as the dependent measure, secondary appraisals were included.

From Experiment 1 and theory, it was expected that threat would contribute significantly to the explanation of variance in stress.

Although in Experiment 1 challenge did not make a unique contribution, and at best was only moderately related to stress, theory suggests that it should be related and therefore, it was included. With respect to threat, theory and evidence from Experiment 1 suggests that the secondary appraisals of degree of uncertainty, level of conflict/confusion and level of helplessness should make significant contributions. Level of uncertainty and level of control and confidence should also contribute significantly to the explanation of variance in challenge. Theoretically, perceived level of difficulty and importance and the ability measures should contribute significantly to the explanation of all three appraisals. Based on theory and the results of Experiment 1, it was also expected that emotionality would make unique contributions to the variance in all three variables. Finally, study time should also make a significant contribution to the variance in all three. In contrast, the TAI should not make a significant unique contribution to the explanation of variance in any of the three appraisals.

Folkman and Lazarus (1985) demonstrated that coping strategies change as task demands change. They also suggested that secondary appraisals were related to coping. Experiment 1 indicated that increases in emotion-focused coping were related to increases in problem-focused coping and, to a lesser degree, off-task thoughts and emotionality. However, the variables in the model could not account for a significant proportion of variance in problem-focused coping. To

investigate further the factors that contributed to individual differences in the level of problem-focused and emotion-focused coping, standard multiple regressions were computed for each variable. Similar to Experiment 1, the variables included were measures of secondary appraisal, measures of ability, perceived level of difficulty and importance and amount of off-task thoughts. As with the other analyses in this experiment, study time was also included in these analyses. In order to evaluate the contribution of test anxiety to individual differences, the TAI was included in all regressions. Finally, for the regressions with emotion-focused coping as the dependent variable, problem-focused coping was also included as an independent variable.

It has been demonstrated that emotionality was highly related to stress and threat and to a lesser degree to emotion-focused coping. Furthermore, this variable represents the arousal component of emotions, which are important indicators of stress in Lazarus' model. According to theory, emotionality should be related to secondary appraisals, perceived level of importance and difficulty, past performance and test anxiety. In Experiment 1, the amount of conflict/confusion experienced, the perceived level of importance, and test anxiety were almost always related to the level of emotionality. It is expected that emotionality will be related to these variables and to the other secondary appraisals in this experiment.

In Experiment 1, off-task thoughts tended to have the highest correlations with the secondary appraisals of conflict/confusion and

with emotionality. It is also expected that off-task thoughts will be related to the other secondary appraisals, perceived level of importance and difficulty, past performance and test anxiety.

Finally, results of Experiment 1 indicated that past performance was always related to present performance. Furthermore, on the test that appeared to present the most difficulty, the five-minute test presented first, emotion-focused coping was negatively related to performance, whereas problem-focused coping was positively related to performance. It is expected that Experiment 3 will confirm that coping strategies are related to performance.

Method

Subjects

Subjects were 46 students selected from a Physical Education 1A6 (Anatomy) class at McMaster University. During the first class meeting of the year, all students in the class were provided with a brief explanation of the study and asked to complete a questionnaire that included demographic data, the Test Anxiety Inventory (TAI) and a question asking whether they would like to participate. Of approximately 200 students in the class, 128 (64%) agreed to participate in the study. Subjects were given $10.00 at the conclusion of the study for their participation.

The 128 students were then rank ordered in terms of scores on the TAI. The sample was divided into three groups, based on the TAI scores. The high test anxious group included the top 25% (TAI scores > 43), the medium test anxious group the middle 50% (TAI scores > 34 and < 44), and the low test anxious group the bottom 25% (TAI scores < 35. Fifteen subjects were randomly selected from each of the three groups and asked to participate. Nine students in the high, 11 in the medium, and 11 in the low test anxious group agreed to participate. To bring the number of subjects up to 46, 15 more subjects were selected; 6 subjects for the high, 5 for the medium, and 4 for the low test

anxious groups. One subject dropped out of school at the end of the first semester; therefore his data were available only for the first term. In total there were 15 high, 16 medium, and 15 low test-anxious subjects. The mean TAI score for the entire sample was 38.44 with a standard deviation of 9.98.

Procedure

All students in Physical Education 1A6 completed 25 multiple-choice tests over the course of the school year. The tests were administered weekly by computer and took a maximum of 20 minutes to complete. The questions were presented individually to the students and at the conclusion of each test they were given their grade. Students could write the test at any time between one and four o'clock on Thursday afternoon. Six of the 25 tests taken were chosen from the early, middle and late parts of each semester: tests 4, 8, and 13 were selected from the first semester and tests 17, 21, and 25 were selected from the second semester. Subjects answered the questionnaires immediately before and after their tests on these days. During the first test, several methodological faults and computer breakdowns occurred. The data from this test were, therefore, eliminated from further analysis. All analyses were on the remaining five tests.

Before the test, subjects completed the WEQ and the CAQ and reported the length of time they had studied for the test. After the

test they completed the WEQ, the CAQ, the CIQ, the CDS, and the condensed R-WOC. The CDS was not analyzed in this experiment.

On the days the study was to be conducted, the examiner was present in the test room to remind all subjects to answer the questionnaires. Signs were also placed outside the room to ensure that subjects checked in with the examiner. Before taking the test, subjects were administered the questionnaires by computer. Subjects were presented with all questionnaires in a format in which questions were presented one at a time. For each questionnaire, the directions and the appropriate scale was always visible at the top of the screen. If subjects entered any information that was not in the range expected, they were prompted with a message stating that their response was out of range and requested to reenter their response.

The subjects then took their test and logged back on the computer to complete the after questionnaires.

Results

The analyses in this experiment follow a pattern similar to Experiment 1. The first section tests the hypothesis that test difficulty affects cognitive appraisals. The second section examines the hypothesis that there is consistency in the process that people use to appraise stressful situations.

All data in the first section of this experiment were analyzed using planned comparisons. These planned comparisons were computed by specifying the appropriate contrast coefficients in the SPSS program. In this experiment the planned contrasts compared the review test with the other four tests. This procedure allows for more fine-grained analysis than an omnibus F-test and protects against inflated Type 1 error (Tabachnick & Fidell, 1983).

To examine the interrelationships of the variables, standard multiple regressions were calculated. According to Tabachnick and Fidell (1983), with standard regressions, the significance test of a regression coefficient is sensitive only to the unique contribution of that variable to the regression. Consequently, they advocate reporting and interpreting zero-order correlations between the dependent variable and independent variables. However, they also suggest using a conservative F-test which controls for probability level on multiple post-hoc tests. Zero-order correlations are reported and, where

relevant, are interpreted. Tabachnick and Fidell (1983) also advocate reporting shared variance, which is the total amount of variance explained minus the amount of variance explained by the unique contribution of variables.

When using independent variables that are correlated, multicollinearity can be a problem. However, as in Experiment 1, no variables in any of the regressions had tolerances below about .20 and very few were below .3, indicating that multicollinearity was not a problem. In this experiment, missing data were handled by excluding subjects only on analyses for which there are missing data. Consequently, there are slight differences in degrees of freedom across analyses.

In all regression equations, the amount of variance reported represents the adjusted R squared, which corrects for sample size. The amount of unique variance contributed by individual variables represents the squared semi-partial correlation between that variable and the dependent variable.

Test Differences

Test Difficulty. A 2 (test session; review test vs. other tests) by 2 (Time; before vs. after) repeated measures ANOVA with repeated measures on both factors was computed with perceived difficulty as the

dependent measure. Results indicated that the review test was perceived as being significantly more difficult than the other tests [F (1,38)= 9.95, p< .003], for means and s.d. see Table 23). Furthermore, a one-way (test session; review test vs. other tests) repeated measures ANOVA with test scores as the dependent measure revealed that students obtained significantly lower grades on the review than on the other four tests [F (1,41)= 22.88, p<.001] (see Table 24), indicating that it was more difficult.

Stress, Threat, Challenge, Worry and Emotionality. A 2 (test session; review test vs. other tests) by 2 (Time; before vs. after) repeated measures MANOVA with repeated measures on both factors was computed with stress, threat, challenge, worry, and emotionality as the dependent measures. The review test, compared to the other four, was significantly more stressful [F (1,38)= 9.00, p< .003], threatening [F (1,38)= 14.89, p< .001], challenging [F (1,38)= 7.92, p< .003], and worrisome [F (1,38)= 9.00, p< .003], but not more emotionally arousing [F (1,38)= 0.00, p> .05, see Table 23]. After the tests, compared to before, students reported being significantly less stressed [F (1,38)=23.45, p< .001], threatened [F (1,38)= 4.00, p< .05], challenged [F (1,38)= 7.92, p< .01], worried [F (1,38)=8.74, p< .005], and emotionally aroused [F (1,38)= 22.38, p< .001]. There were no significant interactions. It can be concluded that the review test, compared to the other tests, was more difficult and was perceived as

Table 23

Means and Standard Deviations of Self-Report Measures in Experiment 3

Test	Difficulty	Stress	Threat	Challenge	Worry	Emotionality
One (n=46)						
Before						
M	4.91	3.17	2.37	4.39	12.30	10.89
SD	0.96	1.36	1.40	1.50	4.21	4.61
After						
M	5.13	2.73	2.60	4.44	14.29	9.89
SD	0.99	1.67	1.72	1.66	5.84	4.30
Two (n=45)						
Before						
M	5.42	3.78	3.00	4.93	12.60	11.13
SD	0.92	1.65	1.41	1.59	4.36	4.47
After						
M	5.07	2.64	2.64	4.47	12.58	8.53
SD	1.32	1.82	1.68	1.60	4.21	4.06
Three (n=45)						
Before						
M	4.89	3.58	2.91	4.78	7.61	18.49
SD	1.01	1.67	1.70	1.22	3.25	6.55
After						
M	4.79	2.09	2.28	4.19	11.12	14.65
SD	1.21	1.63	1.56	1.62	5.07	11.35
Four (n=44)						
Before						
M	5.48	3.82	3.18	5.11	12.00	9.77
SD	1.00	1.60	1.70	1.48	4.85	4.50
After						
M	5.57	2.95	2.86	4.41	12.38	8.36
SD	1.33	1.90	1.92	1.62	5.64	4.20
Review (n=46)						
Before						
M	5.91	4.33	3.57	5.22	14.63	12.94
SD	1.01	1.54	1.57	1.38	4.54	4.97
After						
M	5.30	3.13	3.17	4.85	15.30	10.52
SD	1.05	2.06	1.78	1.76	5.66	4.64

such by the students. Furthermore, students reported experiencing more stress, threat, worry and challenge, but not more emotional arousal, while taking this test. Finally, after the test was over, when students knew their grades, levels of stress, threat, challenge, worry and physiological arousal decreased significantly.

Ways of Coping. Coping strategies were measured only after subjects completed the tests. The same planned contrast, comparing the review test to all others, was computed to determine if the review test differed from the others on the level of problem-focused and emotion-focused coping strategies. A one-way (test session; review test vs. other tests) repeated measures MANOVA with emotion-focused and problem-focused coping as the dependent measures was computed. As predicted, on the review test, compared to the other tests, students used significantly more emotion-focused [F (1,38)= 10.31, $p< .003$, see Table 24], but not problem-focused [F (1,38)= 2.34, $p> .05$] coping.

Discussion

The results of Experiment 3 were similar to those found in the previous experiments and consistent with the theory of stress and coping. Students' cognitive appraisals and emotion-focused coping were responsive to the demands of the task. The review test, which required the mastery of material for a whole term, was more difficult and was

Table 24

Means and Standard Deviations After the Tests in Experiment 3

Test	Problem-Focused Coping	Emotion-Focused Coping	Performance on Present Test
One			
M	13.27	21.67	14.75
SD	4.53	11.27	3.01
N	45	45	45
Two			
M	11.84	18.58	15.02
SD	4.78	11.36	2.94
N	45	45	45
Three			
M	10.02	8.33	17.43
SD	4.38	4.52	1.73
N	45	42	44
Four			
M	10.24	16.91	14.57
SD	5.01	9.89	3.18
N	42	42	44
Review			
M	12.39	22.59	13.15
SD	4.26	11.13	3.45
N	46	46	46

perceived as significantly more difficult than tests which covered the work of only one week. This increased difficulty appeared to produce higher levels of stress, threat and challenge, and higher levels of worry and emotion-focused coping. The decrease in levels of stress, threat, challenge, worry and emotionality after the tests suggests the demands that caused the high levels of stress had decreased.

Individual Differences

Stress. Five standard multiple regressions were computed with stress as the dependent variable and threat, challenge, importance, perceived difficulty, study time, the TAI, high school average, and performance on the previous test as the independent measures. A significant amount of variance (between 51% and 75%) in stress could be explained by the independent variables (see Tables 25 to 27). As in Experiment 1, a large proportion of the variance was shared variance, indicating a large overlap among the variables. For stress, correlations larger than about .60 would be considered significant using the conservative F-test proposed by Tabachnick and Fidell (1983). Threat and emotionality had high zero-order correlation with stress and made significant unique contributions on all but one regression. However, challenge was not correlated with stress and did not make a unique contribution to the explanation of variance.

Table 25

Standard Multiple Regressions on Stress Before the Tests in Experiment 3

Test One (n=45)

Variable	DV	1	2	3	4	5	6	7	8	9	b	B	sr^2
1.TAI	.27	--									-.03	-.02	
2.HS	-.16	-.33	--								.00	.04	
3.Study	.28	.25	-.12	--							-.04	-.06	
4.Test Before	-.42	-.44	.39	-.16	--						-.07	-.16	
5.Threat	.67	.31	-.28	.24	-.42	--					.38***	.39	.08
6.Challenge	.17	.26	.15	.27	.09	-.10	--				.23	.25	
7.Importance	.28	.21	-.09	.45	-.16	.20	.34	--			.15	.14	
8.Difficulty	.20	.13	.12	.18	-.13	.13	.52	.24	--		-.08	-.05	
9.Emotionality	.69	.46	-.25	.32	-.44	.63	.03	.06	.10	--	.15**	.49	.11

R^2=.65
Adj R^2=.56
F(9,35)=7.31, p<.001
R=.81

Test Two (n=43)

Variable	DV	1	2	3	4	5	6	7	8	9	b	B	sr^2
1.TAI	.27	--									.00	.03	
2.HS	-.20	-.32	--								-.02	-.14	
3.Study	.05	.01	.18	--							.07	.12	
4.Test Before	.04	-.45	.24	-.03	--						.23*	.30	.07
5.Threat	.71	.40	-.24	-.03	-.23	--					.71***	.60	.17
6.Challenge	.18	.10	.19	-.03	-.11	.11	--				.20	.19	
7.Importance	.42	.26	-.22	.02	-.11	.51	.27	--			-.03	-.03	
8.Difficulty	.23	-.03	.21	.21	.03	.26	.40	.17	--		-.07	-.04	
9.Emotionality	.54	.34	-.13	-.03	-.22	.62	.02	.42	.16	--	.08	.22	

R^2=.62
Adj R^2=.51
F(9,33)=5.87, p<.001
R=.79

*p<.05. **p<.01. ***p<.001

Table 26

Standard Multiple Regressions on Stress
Before the Tests in Experiment 3

Test Three (n=41)

Variable	DV	1	2	3	4	5	6	7	8	9	b	B	sr^2
1.TAI	.39	--									.01	.05	
2.HS	-.24	-.34	--								-.01	-.06	
3.Study	.41	-.01	.05	--							.04	.13	
4.Test Before	-.18	-.35	.32	.10	--						.01	.02	
5.Threat	.84	.30	-.16	.38	-.14	--					.75***	.73	.28
6.Challenge	.45	.42	-.02	.24	.05	.58	--				-.20	.15	
7.Importance	.44	.26	-.25	.35	-.10	.35	.28	--			.15	.10	
8.Difficulty	.40	.11	.05	.35	-.04	.44	.38	.17	--		.11	.07	
9.Emotionality	.42	.58	-.16	-.07	-.20	.26	.30	.23	.01	--	.06*	.23	.03

R^2=.80
Adj R^2=.75
F(9,31)=13.98, p<.001
R=.90

Test Four (n=43)

Variable	DV	1	2	3	4	5	6	7	8	9	b	B	sr^2
1.TAI	.31	--									-.02	-.15	
2.HS	-.12	-.23	--								-.03	-.12	
3.Study	.29	.24	-.12	--							.07	.08	
4.Test Before	-.11	.17	.11	-.19	--						-.02	-.02	
5.Threat	.67	.37	-.12	.23	-.14	--					.41**	.44	.13
6.Challenge	.36	.32	.07	.13	.21	.23	--				.13	.12	
7.Importance	.43	.29	-.15	.36	-.06	.34	.24	--			.11	.09	
8.Difficulty	.33	.11	.27	.13	.33	.16	.31	.27	--		.30	.18	
9.Emotionality	.60	.48	-.05	.17	-.15	.47	.31	.31	.18	--	.12**	.35	.07

R^2=.64
Adj R^2=.54
F(9,33)=6.37, p<.001
R=.80

*p<.05. **p<.01. ***p<.001

Table 27

Standard Multiple Regressions on Stress Before the Tests in Experiment 3

Review Test (n=44)

Variable	DV	1	2	3	4	5	6	7	8	9	b	B	sr^2
1.TAI	.46	--									.01	.05	
2.HS	-.23	-.33	--								-.01	-.08	
3.Study	.32	.25	-.21	--							.03	.07	
4.Test Before	-.36	-.38	.33	-.29	--						-.03	-.06	
5.Threat	.60	.34	-.24	.38	-.29	--					.12	.11	
6.Challenge	.23	.10	.35	-.01	.11	.03	--				.10	.09	
7.Importance	.49	.38	-.21	.46	-.22	.46	.09	--			.22	.18	
8.Difficulty	.19	.02	.18	.31	-.02	-.02	.18	.33	--		.13	.09	
9.Emotionality	.72	.43	-.15	.09	-.33	.63	.28	.26	.04	--	.16***	.51	.11

R^2=.65
Adj R^2=.56
$F(9,34)=6.95$, $p<.001$ R=.81

*$p<.05$. **$p<.01$. ***$p<.001$

Threat. Five standard multiple regressions were computed with threat as the dependent variable and emotionality, uncertainty, conflict/confusion, helplessness, control, confidence, importance, perceived difficulty, study time, the TAI, high school average, and performance on the previous test as the independent variables. Between 35% and 63% of the variance in threat could be accounted for by the independent variables (see Tables 28 to 30). No variable regularly made unique contributions to the explanation of variance, and almost all of the explained variance related to shared variance. For threat, correlations larger than about .67 would be considered significant using the conservative F-test proposed by Tabachnick and Fidell (1983). The secondary appraisal of helplessness had significant zero-order correlations with threat on three of the five regressions.

Challenge. Five standard multiple regressions were computed with challenge as the dependent variable and emotionality, uncertainty, conflict/confusion, helplessness, control, confidence, importance, perceived difficulty, study time, the TAI, high school average, and performance on the previous test as the independent variables. As in Experiment 1, a smaller proportion of variance in challenge was explained (see Tables 31 to 33). One regression was not significantly different from zero and only between 23% and 38% of the variance could be explained on the others. Unlike Experiment 1, no variable made regular contributions to the explanation of variance. Correlations

Table 28

Standard Multiple Regressions on Threat Before the Tests in Experiment 3

Test One (n=45)

	DV	1	2	3	4	5	6	7	8	9	10	11	12	b	B	sr^2
1.TAI	.31	--												-.02	-.11	
2.HS	-.28	-.33	--											-.01	-.09	
3 Test Before	-.42	-.44	.39	--										-.05	-.12	
4.Study	.24	.25	-.12	-.16	--									.00	-.01	
5.Uncertainty	.33	.28	-.11	-.18	.03	--								-.18	-.19	
6.Conflict	.53	.55	-.27	-.45	.17	.62	--							.12	.12	
7.Helpless.	.54	.41	-.15	-.28	.13	.71	.68	--						.19	.21	
8.Control	-.20	-.07	-.01	-.13	.00	-.24	-.21	-.43	--					-.03	-.03	
9.Confidence	-.53	-.23	.28	.29	-.08	-.59	-.55	-.71	.44	--				-.21	-.21	
10.Importance	.20	.21	-.09	-.16	.45	-.13	.06	.07	.00	.06	--			.13	.12	
11.Difficulty	.13	.13	.12	-.13	.18	.36	.12	.17	.21	.07	.24	--		.16	.11	
12.Emotionality	.63	.46	-.25	-.44	.32	.41	.67	.57	-.15	-.53	.06	.10	--	.11	.35	

R^2=.53
Adj R^2=.35
F(12,32)=2.96, p<.01
R=.73

Test Two (n=43)

	DV	1	2	3	4	5	6	7	8	9	10	11	12	b	B	sr^2
1.TAI	.40	--												.01	.10	
2.HS	-.24	-.32	--											-.00	-.03	
3 Test Before	-.23	-.45	.24	--										-.07	-.12	
4.Study	-.03	.01	.18	-.03	--									-.05	-.10	
5.Uncertainty	.20	.19	-.02	-.16	.05	--								-.20	-.21	
6.Conflict	.52	.45	-.20	-.02	-.13	.53	--							.23	.22	
7.Helpless.	.67	.27	-.22	-.20	-.06	.39	.64	--						.37*	.39	.06
8.Control	-.21	-.30	.14	.07	-.21	-.43	-.36	-.39	--					-.22	-.21	
9.Confidence	-.21	-.40	.24	.21	.19	-.49	-.52	-.48	.54	--				.28	.26	
10.Importance	.51	.26	-.22	-.11	.02	.08	.18	.26	.13	-.04	--			.27*	.29	.06
11.Difficulty	.26	-.03	.21	.03	.21	.51	.19	.26	.01	-.04	.17	--		.30	.19	
12.Emotionality	.62	.34	-.13	-.22	-.03	.19	.57	.61	-.17	-.34	.42	.16	--	.04	.13	

R^2=.68
Adj R^2=.55
F(12,30)=5.28, p<.001
R=.82

*p<.05. **p<.01. ***p<.001

Table 29

Standard Multiple Regressions on Threat Before the Tests in Experiment 3

Test Three (n=41)

	DV	1	2	3	4	5	6	7	8	9	10	11	12	b	B	sr^2
1.TAI	.30	--												.02	.14	
2.HS	-.16	-.34	--											.00	.00	
3 Test Before	-.14	-.35	.32	--										.05	.08	
4.Study	.38	-.01	.05	.10	--									.05	.16	
5.Uncertainty	.71	.38	-.11	-.16	.39	--								.17	.17	
6.Conflict	.71	.43	-.24	-.25	.35	.80	--							.17	.16	
7.Helpless.	.70	.39	-.25	-.31	.11	.59	.63	--						.40*	.44	.07
8.Control	.11	-.32	.05	.07	.02	.03	.09	-.14	--					.33*	.32	.05
9.Confidence	-.18	-.06	-.08	.05	.09	-.09	-.08	-.26	.55	--				-.32	-.24	
10.Importance	.35	.26	-.25	-.10	.35	.28	.20	.24	-.07	.06	--			.20	.14	
11.Difficulty	.44	.11	.05	-.04	.35	.30	.25	.47	.02	-.15	.17	--		.03	.02	
12.Emotionality	.26	.58	-.16	-.20	-.07	.27	.34	.40	-.11	-.12	.23	.01	--	-.02	-.10	

R^2=.74
Adj R^2=.63
F(12,28)=6.73, p<.001
R=.86

Test Four (n=43)

	DV	1	2	3	4	5	6	7	8	9	10	11	12	b	B	sr^2
1.TAI	.31	--												.01	.04	
2.HS	-.12	-.23	--											.00	.00	
3 Test Before	-.14	.17	.11	--										-.06	-.07	
4.Study	.23	.24	-.12	-.19	--									.10	.11	
5.Uncertainty	.50	.30	.22	.17	.05	--								.11	.10	
6.Conflict	.67	.41	-.09	.01	.20	.67	--							.47	.42	
7.Helpless.	.58	.31	-.02	-.03	.01	.55	.62	--						.26	.26	
8.Control	-.17	-.32	.10	-.27	.20	-.36	-.15	-.44	--					.03	.03	
9.Confidence	-.15	-.20	.12	.14	.42	-.24	-.10	-.21	.35	--				-.11	-.08	
10.Importance	.34	.29	-.15	-.06	.36	.17	.25	.23	.03	.21	--			.19	.16	
11.Difficulty	.16	.11	.27	.33	.13	.46	.36	.31	-.06	.24	.27	--		-.23	-.13	
12.Emotionality	.47	.48	-.05	-.15	.17	.55	.55	.46	-.31	-.27	.31	.18	--	-.01	-.02	

R^2=.56
Adj R^2=.38
F(12,30)=3.18, p<.005
R=.75

*p<.05. **p<.01. ***p<.001

Table 30

Standard Multiple Regressions on Threat
Before the Tests in Experiment 3

	Review Test (n=44)														
	DV	1	2	3	4	5	6	7	8	9	10	11	12	b	B	sr^2
1.TAI	.34	--												-.02	.12	
2.HS	-.24	-.33	--											-.00	-.00	
3 Test Before	-.29	-.38	.33	--										.01	.03	
4.Study	.38	.25	-.21	-.29	--									.08	.22	
5.Uncertainty	.40	.08	.06	-.02	.22	--								.01	.01	
6.Conflict	.58	.46	-.11	-.26	.35	.67	--							.17	.18	
7.Helpless.	.71	.35	-.18	-.25	.26	.68	.74	--						.29	.33	
8.Control	-.49	-.23	.09	.30	.03	-.37	-.36	-.53	--					-.29	-.26	
9.Confidence	-.32	-.27	.11	.17	-.23	-.33	-.34	-.35	.61	--				.21	.17	
10.Importance	.46	.38	-.21	-.22	.46	-.02	.29	.26	.02	-.12	--			.42*	.35	.06
11.Difficulty	-.02	.02	.18	.17	.31	.36	.36	.17	.18	.08	.33	--		-.44*	-.30	.05
12.Emotionality	.63	.43	-.15	-.33	.09	.52	.66	.73	-.59	-.45	.26	.04	--	.05	.15	

R^2=.72
Adj R^2=.61
$F(12,31)=6.53$, $p<.001$ R=.85

*p<.05. **p<.01. ***p<.001

Table 31

Standard Multiple Regressions on Challenge Before the Tests in Experiment 3

Test One (n=45)

	DV	1	2	3	4	5	6	7	8	9	10	11	12	b	B	sr^2
1.TAI	.26	--												.05*	.34	.07
2.HS	.15	-.33	--											.02	.14	
3 Test Before	.09	-.44	.39	--										.09	.19	
4.Study	.27	.25	-.12	-.16	--									.08	.11	
5.Uncertainty	.24	.28	-.11	-.18	.03	--								.33	.32	
6.Conflict	.09	.55	-.27	-.45	.17	.62	--							-.02	-.02	
7.Helpless.	.06	.41	-.15	-.28	.13	.71	.68	--						-.41	-.42	
8.Control	-.06	-.07	-.01	-.13	.00	-.24	-.21	-.43	--					-.18	-.19	
9.Confidence	.06	-.23	.28	.29	-.08	-.59	-.55	-.71	.44	--				-.05	-.05	
10.Importance	.34	.21	-.09	-.16	.45	-.13	.06	.07	.00	.06	--			.28	.24	
11.Difficulty	.52	.13	.12	-.13	.18	.36	.12	.17	.21	.07	.24	--		.64*	.42	.10
12.Emotionality	.03	.46	-.25	-.44	.32	.41	.67	.57	-.15	-.53	.06	.10	--	-.01	-.04	

R^2=.51
Adj R^2=.32
$F(12,32)=2.76$, $p<.01$
R=.71

Test Two (n=43)

	DV	1	2	3	4	5	6	7	8	9	10	11	12	b	B	sr^2
1.TAI	.10	--												-.01	.04	
2.HS	.19	-.32	--											.04	.29	
3 Test Before	-.11	-.45	.24	--										-.15	-.20	
4.Study	-.03	.01	.18	-.03	--									-.12	-.19	
5.Uncertainty	.51	.19	-.02	-.16	.05	--								-.37	-.34	
6.Conflict	.21	.45	-.20	-.02	-.13	.53	--							.23	.19	
7.Helpless.	.10	.27	-.22	-.20	-.06	.39	.64	--						-.19	-.17	
8.Control	-.12	-.30	.14	.07	-.21	-.43	-.36	-.39	--					-.22	-.18	
9.Confidence	-.15	-.40	.24	.21	.19	-.49	-.52	-.48	.54	--				.08	.07	
10.Importance	.27	.26	-.22	-.11	.02	.08	.18	.26	.13	-.04	--			.44*	.41	.11
11.Difficulty	.40	-.03	.21	.03	.21	.51	.19	.26	.01	-.04	.17	--		.36	.20	
12.Emotionality	.02	.34	-.13	-.22	-.03	.19	.57	.61	-.17	-.34	.42	.16	--	-.09	-.25	

R^2=.47
Adj R^2=.26
$F(12,30)=2.21$, $p<.05$
R=.69

*$p<.05$. **$p<.01$. ***$p<.001$

Table 32

Standard Multiple Regressions on Challenge
Before the Tests in Experiment 3

Test Three (n=41)

	DV	1	2	3	4	5	6	7	8	9	10	11	12	b	B	sr^2
1.TAI	.42	--												.05*	.41	.06
2.HS	-.02	-.34	--											.01	.11	
3 Test Before	-.05	-.35	.32	--										.11	.25	
4.Study	.24	-.01	.05	.10	--									-.02	-.07	
5.Uncertainty	.55	.38	-.11	-.16	.39	--								.18	.25	
6.Conflict	.52	.43	-.24	-.25	.35	.80	--							.13	.16	
7.Helpless.	.37	.39	-.25	-.31	.11	.59	.63	--						-.02	-.04	
8.Control	.20	-.32	.05	.07	.02	.03	.09	-.14	--					.22	.29	
9.Confidence	.09	-.06	-.08	.05	.09	-.09	-.08	-.26	.55	--				.01	.01	
10.Importance	.28	.26	-.25	-.10	.35	.28	.20	.24	-.07	.06	--			.15	.14	
11.Difficulty	.38	.11	.05	-.04	.35	.30	.25	.47	.02	-.15	.17	--		.29	.24	
12.Emotionality	.30	.58	-.16	-.20	-.07	.27	.34	.40	-.11	-.12	.23	.01	--	.00	.01	

R^2=.56
Adj R^2=.38
F(12,28)=3.00, p<.01 R=.75

Test Four (n=43)

	DV	1	2	3	4	5	6	7	8	9	10	11	12	b	B	sr^2
1.TAI	.32	--												.03	.19	
2.HS	.07	-.23	--											-.01	-.05	
3 Test Before	.21	.17	.11	--										.05	.06	
4.Study	.13	.24	-.12	-.19	--									-.02	-.02	
5.Uncertainty	.53	.30	.22	.17	.05	--								.56	.61	
6.Conflict	.34	.41	-.09	.01	.20	.67	--							-.06	-.06	
7.Helpless.	.17	.31	-.02	-.03	.01	.55	.62	--						-.17	-.20	
8.Control	-.15	-.32	.10	-.27	.20	-.36	-.15	-.44	--					.03	.03	
9.Confidence	-.02	-.20	.12	.14	.42	-.24	-.10	-.21	.35	--				.12	.09	
10.Importance	.24	.29	-.15	-.06	.36	.17	.25	.23	.03	.21	--			.12	.12	
11.Difficulty	.31	.11	.27	.33	.13	.46	.36	.31	-.06	.24	.27	--		.05	.03	
12.Emotionality	.31	.48	-.05	-.15	.17	.55	.55	.46	-.31	-.27	.31	.18	--	.00	.01	

R^2=.37
Adj R^2=.12
F(12,30)=1.47, p<.05 R=.61

*p<.05. **p<.01. ***p<.001

Table 33

Standard Multiple Regressions on Challenge Before the Tests in Experiment 3

		Review Test (n=44)														
	DV	1	2	3	4	5	6	7	8	9	10	11	12	b	B	sr^2
1.TAI	.10	--												.04	.32	
2.HS	.35	-.33	--											.05*	.38	.11
3 Test Before	.11	-.38	.33	--										.06	.13	
4.Study	-.01	.25	-.21	-.29	--									.04	.13	
5.Uncertainty	.23	.08	.06	-.02	.22	--								.38	.38	
6.Conflict	.02	.46	-.11	-.26	.35	.67	--							-.56**	-.70	.13
7.Helpless.	.11	.35	-.18	-.25	.26	.68	.74	--						-.07	-.09	
8.Control	-.04	-.23	.09	.30	.03	-.37	-.36	-.53	--					.05	.05	
9.Confidence	.01	-.27	.11	.17	-.23	-.33	-.34	-.35	.61	--				.20	.18	
10.Importance	.09	.38	-.21	-.22	.46	-.02	.29	.26	.02	-.12	--			.07	.06	
11.Difficulty	.18	.02	.18	.17	.31	.36	.36	.17	.18	.08	.33	--		.17	.13	
12.Emotionality	.28	.43	-.15	-.33	.09	.52	.66	.73	-.59	-.45	.26	.04	--	.18**	.64	.13

R^2=.45
Adj R^2=.23
$F(12,31)=2.09$, $p<.05$ R=.67

*p<.05. **p<.01. ***p<.001

larger than about .67 would be considered significant using the conservative F-test proposed by Tabachnick and Fidell (1983) and no zero-order correlations met this stringent criterion.

Discussion

There are some similarities between the results of Experiment 3 and the results of Experiment 1 for stress and threat. A large proportion of variance in stress and threat could be accounted for by the independent variables. For the regressions with stress as the dependent variable, threat and emotionality almost always made unique contributions. However, unlike Experiment 1, for the regressions with threat as dependent variables, no variables made consistent significant unique contributions. For challenge, a smaller proportion of variance could be explained and, unlike Experiment 1 no variables made a regular unique contribution to the explanation of variance. Finally, for threat and challenge, very few of the zero-order correlations reached significance using the conservative F-test suggested by Tabachnick and Fidell (1983).

Ways of Coping

Problem-Focused Coping. Five standard multiple regressions were computed with problem-focused coping as the dependent variable and emotionality, uncertainty, conflict/confusion, helplessness, control,

confidence, importance, perceived difficulty, study time, the TAI, high school average, and CIQ as the independent variables. A significant amount of variance was accounted for on only two of the five regressions; the review test (22%) and one other (54%, see Tables 34 to 36). Most of the variance was shared variance. Correlations larger than about .67 would be considered significant using the conservative F-test proposed by Tabachnick and Fidell (1983). Emotionality made a unique contribution on only the review test. On the other test on which there was a significant relationship, the secondary appraisal of conflict/confusion and off-task thoughts had high zero-order correlations with problem-focused coping and with each other.

Emotion-Focused Coping. Five standard multiple regressions were computed with emotion-focused coping as the dependent variable and emotionality, uncertainty, conflict/confusion, helplessness, control, confidence, importance, perceived difficulty, study time, the TAI, high school average, problem-focused coping and CIQ as the independent variables. Between 20% and 67% of the variance in emotion-focused coping could be accounted for by the independent variables (see Tables 37 to 39). In contrast to Experiment 1, in most cases the majority of the explained variance was related to unique contributions. Off-task thoughts contributed significant unique variance on four and problem-

Table 34

Standard Multiple Regressions on Problem-Focused Coping
After the Tests on Experiment 3

Test One (n=45)

	DV	1	2	3	4	5	6	7	8	9	10	11	12	b	B	sr^2
1.TAI	-.03	--												-.17	-.39	
2.HS	-.06	-.33	--											-.04	-.09	
3 CIQ	.15	.63	-.17	--										.21	.37	
4.Study	.22	.26	-.12	.21	--									.67	.29	
5.Uncertainty	.02	.28	-.11	.39	.03	--								.58	.19	
6.Conflict	.11	.55	-.27	.58	.18	.63	--							.47	.14	
7.Helpless.	-.07	.42	-.15	.59	.13	.72	.70	--						-.22	-.08	
8.Control	.29	-.08	-.01	-.28	.01	-.24	-.24	-.42	--					.91	.31	
9.Confidence	.15	-.25	.28	-.38	-.07	-.59	-.57	-.71	.42	--				1.38	.43	
10.Importance	-.11	.22	-.09	.21	.44	-.13	.07	.07	.01	.08	--			-.76	-.22	
11.Difficulty	-.03	.12	.12	.16	.19	.36	.11	.19	.19	.05	.26	--		-.94	-.20	
12.Emotional.	.24	.46	-.26	.63	.33	.42	.67	.59	-.18	-.57	.08	.08	--	.27	.27	

R^2=.41
Adj R^2=.18
F(12,31)=1.77, p>.05 R=.64

Test Two (n=43)

	DV	1	2	3	4	5	6	7	8	9	10	11	12	b	B	sr^2
1.TAI	.13	--												.05	.11	
2.HS	.03	-.32	--											.01	.04	
3 CIQ	.28	.60	-.11	--										.10	-.16	
4.Study	-.29	.00	.18	-.13	--									-.71	-.41	
5.Uncertainty	.01	.19	-.03	.45	.00	--								.17	.05	
6.Conflict	.18	.43	-.19	.48	-.18	.58	--							.09	.03	
7.Helpless.	.10	.27	-.22	.44	-.11	.45	.68	--						-.45	-.15	
8.Control	.14	-.29	.15	-.31	-.14	-.49	-.44	-.46	--					-.23	-.07	
9.Confidence	.14	-.38	.24	-.44	.24	-.54	-.59	-.55	.60	--				1.83	.55	
10.Importance	.16	.26	-.22	.32	-.02	.13	.23	.30	.05	-.11	--			-.22	-.07	
11.Difficulty	.13	-.02	.19	.32	.15	.55	.27	.34	-.09	-.14	.21	--		.63	.12	
12.Emotional.	.36	.34	-.14	.47	-.07	.25	.61	.65	-.25	-.40	.45	.23	--	.52	.50	

R^2=.42
Adj R^2=.20
F(12,31)=1.87, p>.05 R=.65

*p<.05. **p<.01. ***p<.001

Table 35

Standard Multiple Regressions on Problem-Focused Coping
After the Tests in Experiment 3

Test Three (n=41)

	DV	1	2	3	4	5	6	7	8	9	10	11	12	b	B	sr^2
1.TAI	.35	--												.04	.10	
2.HS	-.20	-.34	--											-.01	-.03	
3 CIQ	.76	.40	-.10	--										.43	.40	
4.Study	.21	-.02	.05	.26	--									.10	.12	
5.Uncertainty	.62	.39	-.11	.74	.39	--								.04	.01	
6.Conflict	.71	.43	-.24	.83	.34	.80	--							.24	.09	
7.Helpless.	.61	.40	-.25	.65	.10	.59	.63	--						.78	.33	
8.Control	.11	-.33	.05	.05	.04	.03	.07	-.15	--					.71	.27	
9.Confidence	-.15	-.08	-.08	-.20	.10	-.09	-.09	-.27	.57	--				-.59	-.18	
10.Importance	.20	.25	-.25	.16	.36	.28	.19	.24	-.06	.07	--			.14	.04	
11.Difficulty	.10	.11	.05	.23	.35	.30	.25	.47	.01	-.15	.17	--		-1.10	-.26	
12.Emotionality	.40	.58	-.16	.48	-.07	.27	.34	.40	-.11	-.12	.23	.01	--	-.00	-.00	

R^2=.68
Adj R^2=.54
F(12,29)=5.08, p<.001
R=.82

Test Four (n=43)

	DV	1	2	3	4	5	6	7	8	9	10	11	12	b	B	sr^2
1.TAI	.19	--												-.03	-.06	
2.HS	.10	-.16	--											.20	.23	
3 CIQ	.19	.61	-.18	--										.21	.30	
4.Study	.27	.23	-.08	-.09	--									.69	.26	
5.Uncertainty	.01	.31	.26	.26	.04	--								-1.12	-.37	
6.Conflict	.16	.38	.01	.37	.18	.68	--							.96	.30	
7.Helpless.	-.07	.27	.08	.27	-.03	.56	.59	--						-.90	-.31	
8.Control	.06	-.33	.10	-.10	.21	-.36	-.15	-.45	--					-.72	-.21	
9.Confidence	.18	-.20	.13	-.37	.43	-.25	-.10	-.21	.35	--				.19	.05	
10.Importance	.18	.28	-.12	.25	.35	.16	.23	.21	.04	.21	--			.11	.03	
11.Difficulty	.20	.10	.32	-.02	.11	.45	.35	.31	-.06	.24	.26	--		1.08	.22	
12.Emotionality	.21	.46	.02	.61	.16	.55	.53	.44	-.31	-.27	.30	.18	--	.11	.10	

R^2=.27
Adj R^2=.00
F(12,28)=0.87, p>.05
R=.52

*p<.05. **p<.01. ***p<.001

Table 36

Standard Multiple Regressions on Problem-Focused Coping After the Tests in Experiment 3

		Review Test (n=44)														
	DV	1	2	3	4	5	6	7	8	9	10	11	12	b	B	sr^2
1.TAI	.22	--												-.03	-.07	
2.HS	-.16	-.33	--											-.03	-.07	
3 CIQ	.34	.52	-.20	--										-.04	-.07	
4.Study	.07	.25	-.20	.18	--									.06	.06	
5.Uncertainty	.04	.08	.06	.20	.22	--								-.40	-.13	
6.Conflict	.32	.45	-.10	.50	.35	.67	--							1.10	.44	
7.Helpless.	.17	.34	-.18	.46	.26	.68	.74	--						-.69	-.28	
8.Control	.09	-.24	.10	-.19	.03	-.37	-.35	-.52	--					.96	.32	
9.Confidence	.13	-.27	.11	.02	-.23	-.33	-.34	-.35	.59	--				1.06	.30	
10.Importance	.22	.37	-.20	.35	.46	-.02	.29	.26	.03	-.12	--			.30	.09	
11.Difficulty	-.02	.02	.18	.06	.31	.36	.36	.17	.18	.08	.33	--		-.94	-.22	
12.Emotionality	.39	.43	-.16	.55	.09	.52	.66	.73	-.59	-.44	.25	.04	--	.63***	.72	.15

R^2=.44
Adj R^2=.22
$F(12,32)=2.06$, $p<.05$ R=.66

*p<.05. **p<.01. ***p<.001

Table 37

Standard Multiple Regressions on Emotion-Focused Coping
After the Tests in Experiment 3

Test One (n=45)

	DV	1	2	3	4	5	6	7	8	9	10	11	12	13	b	B	sr^2
1.TAI	.43	--													.08	.07	
2.HS	-.30	-.33	--												-.23*	-.24	.04
3 CIQ	.60	.63	-.17	--											.56*	.41	.06
4.Study	.02	.26	-.12	.21	--										-.47	-.08	
5.Uncertainty	.25	.28	-.11	.39	.03	--									-2.22	-.30	
6.Conflict	.43	.55	-.27	.58	.18	.63	--								-.04	-.00	
7.Helpless.	.40	.42	-.15	.59	.13	.72	.70	--							1.59	.22	
8.Control	-.11	-.08	-.01	-.28	.01	-.24	-.24	-.42	--						-.33	-.05	
9.Confidence	-.27	-.25	.28	-.38	-.07	-.59	-.57	-.71	.42	--					1.33	.17	
10.Importance	-.25	.22	-.09	.21	.44	-.13	.07	.07	.01	.08	--				-3.98**	-.47	.13
11.Difficulty	.06	.12	.12	.16	.19	.36	.11	.19	.19	.05	.26	--			2.18	.19	
12.Emotionality	.59	.46	-.26	.63	.33	.42	.67	.59	-.18	-.57	.08	.08	--		.89	.35	
13 Problem.	.28	-.03	-.06	.15	.22	.02	.11	-.07	.29	.15	-.11	-.03	.24	--	.25	.10	

R^2=.68
Adj R^2=.54
$F(13,30)=4.88$, $p<.001$ R=.82

Test Two (n=43)

	DV	1	2	3	4	5	6	7	8	9	10	11	12	13	b	B	sr^2
1.TAI	.40	--													-.09	-.08	
2.HS	-.23	-.32	--												-.20	-.21	
3 CIQ	.67	.60	-.11	--											.91***	.56	.13
4.Study	-.26	.00	.18	-.13	--										.03	.01	
5.Uncertainty	.32	.19	-.03	.45	.00	--									.42	.06	
6.Conflict	.50	.43	-.19	.48	-.18	.58	--								1.81	.22	
7.Helpless.	.39	.27	-.22	.44	-.11	.45	.68	--							.48	.06	
8.Control	-.14	-.29	.15	-.31	-.14	-.49	-.44	-.46	--						.77	.09	
9.Confidence	-.23	-.38	.24	-.44	.24	-.54	-.59	-.55	.60	--					.78	.10	
10.Importance	.18	.26	-.22	.32	-.02	.13	.23	.30	.05	-.11	--				-1.12	-.15	
11.Difficulty	.19	-.02	.19	.32	.15	.55	.27	.34	-.09	-.14	.21	--			-.72	-.06	
12.Emotionality	.46	.34	-.14	.47	-.07	.25	.61	.65	-.25	-.40	.45	.23	--		.01	.00	
13.Problem.	.56	.13	.03	.28	-.29	.01	.18	.10	.14	.14	.16	.13	.36	--	.94**	.38	08

R^2=.42
Adj R^2=.20
$F(13,30)=5.00$, $p<.001$ R=.65

*p<.05. **p<.01. ***p<.001

Table 38

Standard Multiple Regressions on Emotion-Focused Coping
After the Tests in Experiment 3

Test Three (n=41)

	DV	1	2	3	4	5	6	7	8	9	10	11	12	13	b	B	sr^2
1.TAI	.36	--													-.13	-.30	
2.HS	-.43	-.34	--												-.16**	-.41	.12
3 CIQ	.40	.40	-.10	--											.36	.32	
4.Study	-.06	-.02	.05	.26	--										-.03	-.03	
5.Uncertainty	.16	.39	-.11	.74	.39	--									-.64	-.24	
6.Conflict	.36	.43	-.24	.83	.34	.80	--								.99	.35	
7.Helpless.	.35	.40	-.25	.65	.10	.59	.63	--							-.09	-.04	
8.Control	-.16	-.33	.05	.05	.04	.03	.07	-.15	--						-.79	-.29	
9.Confidence	-.06	-.08	-.08	-.20	.10	-.09	-.09	-.27	.57	--					.64	.18	
10.Importance	.04	.25	-.25	.16	.36	.28	.19	.24	-.06	.07	--				-.64	-.16	
11.Difficulty	.02	.11	.05	.23	.35	.30	.25	.47	.01	-.15	.17	--			.38	.09	
12.Emotionality	.62	.58	-.16	.48	-.07	.27	.34	.40	-.11	-.12	.23	.01	--		.45***	.66	.21
13.Problem.	.24	.35	-.20	.76	.21	.62	.71	.61	.11	-.15	.20	.10	.40	--	-.25	-.24	

R^2=.68
Adj R^2=.54
F(13,28)=4.03, p<.001 R=.82

Test Four (n=43)

	DV	1	2	3	4	5	6	7	8	9	10	11	12	13	b	B	sr^2
1.TAI	.41	--													-.02	-.02	
2.HS	-.14	-.16	--												.08	.05	
3 CIQ	.55	.61	-.18	--											.79*	.56	.09
4.Study	.10	.23	-.08	-.09	--										1.25	.23	
5.Uncertainty	.05	.31	.26	.26	.04	--									-1.16	-.20	
6.Conflict	.33	.38	.01	.37	.18	.68	--								1.66	.26	
7.Helpless.	.23	.27	.08	.27	-.03	.56	.60	--							1.32	.23	
8.Control	-.05	-.33	.10	-.10	.21	-.36	-.15	-.45	--						-.34	-.05	
9.Confidence	-.26	-.20	.13	-.37	.43	-.25	-.10	-.21	.35	--					-2.15	-.27	
10.Importance	.08	.28	-.12	.25	.35	.16	.23	.21	.04	.21	--				-.43	-.06	
11.Difficulty	-.10	.10	.32	-.02	.10	.45	.35	.31	-.06	.24	.26	--			-1.34	-.14	
12.Emotionality	.22	.46	.02	.61	.16	.55	.53	.44	-.31	-.27	.30	.18	--		-.89*	-.42	.06
13.Problem	.47	.19	.10	.19	.27	.01	.16	-.07	.06	.18	.18	.20	.21	--	.89**	.45	.15

R^2=.64
Adj R^2=.46
F(13,27)=3.64, p<.005 R=.80

*p<.05. **p<.01. ***p<.001

Table 39

Standard Multiple Regressions on Emotion-Focused Coping
After the Tests in Experiment 3

	Review Test (n=44)																
	DV	1	2	3	4	5	6	7	8	9	10	11	12	13	b	B	sr^2
1.TAI	.53	--													.09	.08	
2.HS	-.34	-.33	--												-.16	-.16	
3 CIQ	.73	.52	-.20	--											.89***	.61	.17
4.Study	.25	.25	-.20	.18	--										.15	.06	
5.Uncertainty	.07	.08	.06	.20	.22	--									-1.19	-.15	
6.Conflict	.52	.45	-.10	.50	.35	.67	--								3.32**	.50	.06
7.Helpless.	.29	.34	-.18	.46	.26	.68	.74	--							-1.03	-.16	
8.Control	-.06	-.24	.10	-.19	.03	-.37	-.35	-.52	--						-.22	-.03	
9.Confidence	.02	-.27	.11	.02	-.23	-.33	-.34	-.35	.60	--					-.36	-.04	
10.Importance	.26	.37	-.20	.35	.46	-.02	.29	.26	.03	-.12	--				-1.02	-.12	
11.Difficulty	.00	.02	.18	.06	.31	.36	.36	.17	.18	.08	.33	--			-.69	-.06	
12.Emotionality	.35	.43	-.16	.55	.09	.52	.66	.73	-.59	-.44	.25	.04	--		-.67	-.29	
13.Problem	.51	.22	-.16	.34	.07	.04	.32	.17	.09	.13	.22	-.02	.39	--	.71*	.27	.04

R^2=.77
Adj R^2=.67
$F(13,31)=7.74$, $p<.001$ R=.87

*p<.05. **p<.01. ***p<.001

focused coping on three regressions. Furthermore, high school average, which was negatively related, and emotionality made significant unique contributions on two regressions. Correlations larger than about .70 would be considered significant using the conservative F-test proposed by Tabachnick and Fidell (1983) An examination of the zero-order correlations indicated no variables had significant correlations with emotion-focused coping.

Discussion

There is some very limited support for the predicted relationship between problem-focused coping and secondary appraisals. On one regression on which significant variance was explained, increases in conflict/confusion were related to increases in levels of problem-focused coping. However, most or all of the variance in problem-focused coping was not explained suggesting that subjects were basing their decisions concerning the use of problem-focused coping on factors not measured in this experiment. Consistent with expectation and the results of Experiment 1, increases in problem-focused coping and in off-task thoughts were related to increases in the use of emotion-focused coping strategies. In addition, on two regressions high levels of emotionality and test anxiety were related to high levels of emotion-focused coping.

Emotionality. Five standard multiple regressions were computed between emotionality as dependent variable and high school average,

time spent studying, performance on the previous test, TAI, degree of uncertainty, level of conflict/confusion, degree of helplessness, degree of perceived control, level of confidence, level of importance and perceived level of difficulty as the independent variables.

Between 25% and 59% of the variance in emotionality could be explained (see Tables 40 to 42). Almost all of this variance was shared among the variables in the regression. Correlations larger than about .67 would be considered significant using the conservative F-test proposed by Tabachnick and Fidell (1983). An examination of the zero order correlations indicated that no variable consistently had significant correlations with emotionality.

Off-Task Thoughts. Five standard multiple regressions were computed between off-task thoughts as dependent variable and high school average, time spent studying, TAI, emotionality, degree of uncertainty, level of conflict/confusion, degree of helplessness, degree of perceived control, level of confidence, level of importance and perceived level of difficulty as the independent variables.

Results were that between 40% and 72% of the variance in off-task thoughts could be explained (see Tables 43 to 45). As has been the case with most other variables, a large proportion of variance was explained by the shared variance. Test anxiety made unique contributions on three and emotionality on two of the regressions. Correlations larger than about .67 would be considered significant

Table 40

Standard Multiple Regressions on Emotionality Before the Tests in Experiment 3

Test One (n=45)

	DV	1	2	3	4	5	6	7	8	9	10	11	b	B	sr^2
1.TAI	.46	--											.04	.09	
2.HS	-.25	-.33	--										.00	.01	
3 Test Before	-.44	-.44	.39	--									-.14	-.10	
4.Study	.32	.25	-.12	-.16	--								.50	.22	
5.Uncertainty	.41	.28	-.11	-.18	.03	--							-.58	-.19	
6.Conflict	.67	.55	-.27	-.45	.17	.62	--						1.36*	.42	.06
7.Helpless.	.57	.41	-.15	-.28	.13	.71	.68	--					.51	.18	
8.Control	-.15	-.07	-.01	-.13	.00	-.24	-.21	-.43	--				.18	.06	
9.Confidence	-.53	-.23	.28	.29	-.08	-.59	-.55	-.71	.44	--			-.78	-.25	
10.Importance	.06	.21	-.09	-.16	.45	-.13	.06	.07	.00	.06	--		-.43	-.13	
11.Difficulty	.10	.13	.12	-.13	.18	.36	.12	.17	.21	.07	.24	--	.26	.06	

R^2=.57
Adj R^2=.43
F(11,33)=4.05, p<.001 R=.76

Test Two (n=43)

	DV	1	2	3	4	5	6	7	8	9	10	11	b	B	sr^2
1.TAI	.34	--											-.03	-.07	
2.HS	-.13	-.32	--										.04	.11	
3 Test Before	-.22	-.45	.24	--									-.43	-.21	
4.Study	-.03	.01	.18	-.03	--								.06	.03	
5.Uncertainty	.19	.19	-.02	-.16	.05	--							-.97	-.32	
6.Conflict	.57	.45	-.20	-.02	-.13	.53	--						1.65*	.50	.07
7.Helpless.	.61	.27	-.22	-.20	-.06	.39	.64	--					.82	.27	
8.Control	-.17	-.30	.14	.07	-.21	-.43	-.36	-.39	--				-.10	-.03	
9.Confidence	-.34	-.40	.24	.21	.19	-.49	-.52	-.48	.54	--			-.29	-.09	
10.Importance	.42	.26	-.22	-.11	.02	.08	.18	.26	.13	-.04	--		.86*	.29	.08
11.Difficulty	.16	-.03	.21	.03	.21	.51	.19	.26	.01	-.04	.17	--	.40	.08	

R^2=.56
Adj R^2=.41
F(11,31)=3.65, p<.005 R=.75

*p<.05. **p<.01. ***p<.001

Table 41

Standard Multiple Regressions on Emotionality Before the Tests in Experiment 3

Test Three (n=41)

	DV	1	2	3	4	5	6	7	8	9	10	11	b	B	sr^2
1.TAI	.58	--											.41**	.61	.19
2.HS	-.16	-.34	--										.07	.13	
3 Test Before	-.20	-.35	.32	--									.17	.07	
4.Study	-.07	-.01	.05	.10	--								-.02	-.02	
5.Uncertainty	.27	.38	-.11	-.16	.39	--							-.58	-.15	
6.Conflict	.34	.43	-.24	-.25	.35	.80	--						.07	.02	
7.Helpless.	.40	.39	-.25	-.31	.11	.59	.63	--					1.27	.36	
8.Control	-.11	-.32	.05	.07	.02	.03	.09	-.14	--				.97	.24	
9.Confidence	-.12	-.06	-.08	.05	.09	-.09	-.08	-.26	.55	--			-.87	-.17	
10.Importance	.23	.26	-.25	-.10	.35	.28	.20	.24	-.07	.06	--		.77	.13	
11.Difficulty	.01	.11	.05	-.04	.35	.30	.25	.47	.02	-.15	.17	--	-1.48	-.23	

R^2=.45
Adj R^2=.25
F(11,29)=2.18, p<.05 R=.67

Test Four (n=43)

	DV	1	2	3	4	5	6	7	8	9	10	11	b	B	sr^2
1.TAI	.48	--											.12	.25	
2.HS	-.05	-.23	--										.04	.05	
3 Test Before	-.15	.17	.11	--									-.65	-.27	
4.Study	.17	.24	-.12	-.19	--								.08	.03	
5.Uncertainty	.55	.30	.22	.17	.05	--							.77	.27	
6.Conflict	.55	.41	-.09	.01	.20	.67	--						.60	.20	
7.Helpless.	.46	.31	-.02	-.03	.01	.55	.62	--					-.07	-.03	
8.Control	-.31	-.32	.10	-.27	.20	-.36	-.15	-.44	--				-.54	-.17	
9.Confidence	-.27	-.20	.12	.14	.42	-.24	-.10	-.21	.35	--			-.35	-.09	
10.Importance	.31	.29	-.15	-.06	.36	.17	.25	.23	.03	.21	--		.46	.15	
11.Difficulty	.18	.11	.27	.33	.13	.46	.36	.31	-.06	.24	.27	--	.03	.01	

R^2=.54
Adj R^2=.37
F(11,31)=3.27, p<.005 R=.73

*p<.05. **p<.01. ***p<.001

Table 42

Standard Multiple Regressions on Emotionality Before the Tests in Experiment 3

		Review Test (n=44)													
	DV	1	2	3	4	5	6	7	8	9	10	11	b	B	sr^2
1.TAI	.43	--											.04	.09	
2.HS	-.15	-.33	--										.01	.03	
3 Test Before	-.33	-.38	.33	--									-.21	-.12	
4.Study	.09	.25	-.21	-.29	--								-.26	-.23	
5.Uncertainty	.52	.08	.06	-.02	.22	--							.51	.15	
6.Conflict	.66	.46	-.11	-.26	.35	.67	--						.75	.26	
7.Helpless.	.73	.35	-.18	-.25	.26	.68	.74	--					.85	.30	
8.Control	-.59	-.23	.09	.30	.03	-.37	-.36	-.53	--				-.52	-.15	
9.Confidence	-.45	-.27	.11	.17	-.23	-.33	-.34	-.35	.61	--			-.38	-.09	
10.Importance	.26	.38	-.21	-.22	.46	-.02	.29	.26	.02	-.12	--		.76	.20	
11.Difficulty	.04	.02	.18	.17	.31	.36	.36	.17	.18	.08	.33	--	-.63	-.13	

R^2=.69
Adj R^2=.59
$F(11,32)=6.58$, $p<.001$ R=.83

*p<.05. **p<.01. ***p<.001

Table 43

Standard Multiple Regressions on CIQ
After the Tests in Experiment 3

Test One (n=45)

	DV	1	2	3	4	5	6	7	8	9	10	11	b	B	sr^2
1.TAI	.63	--											.31**	.38	.09
2.HS	-.17	-.33	--										.04	.05	
3.Study	.21	.26	-.12	--									-.35	-.08	
4.Uncertainty	.39	.28	-.11	.03	--								-.06	-.01	
5.Conflict	.58	.55	-.27	.18	.63	--							.15	.03	
6.Helpless.	.59	.42	-.15	.13	.72	.70	--						1.12	.21	
7.Control	-.27	-.08	-.01	.01	-.24	-.24	-.42	--					-.75	-.14	
8.Confidence	-.38	-.25	.28	-.07	-.59	-.57	-.71	.42	--				.72	.13	
9.Importance	.21	.22	-.09	.44	-.13	.07	.07	.01	.08	--			.61	.10	
10.Difficulty	.16	.12	.12	.19	.36	.11	.19	.19	.05	.26	--		.40	.05	
11.Emotionality	.63	.43	-.26	.33	.42	.67	.59	-.18	-.57	.08	.08	--	.72	.39	

R^2=.62
Adj R^2=.49
F(11.32)=4.72, p<.001 R=.79

Test Two (n=43)

	DV	1	2	3	4	5	6	7	8	9	10	11	b	B	sr^2
1.TAI	.60	--											.38***	.54	.19
2.HS	-.11	-.32	--										.07	.11	
3.Study	-.13	.00	.18	--									-.50	-.19	
4.Uncertainty	.45	.19	-.03	.00	--								1.14	.24	
5.Conflict	.48	.43	-.19	-.18	.58	--							-.79	-.16	
6.Helpless.	.44	.27	-.22	-.11	.45	.68	--						.29	.07	
7.Control	-.31	-.29	.15	-.14	-.49	-.44	-.46	--					-.35	-.07	
8.Confidence	-.44	-.38	.24	.24	-.54	-.59	-.55	.60	--				.09	.02	
9.Importance	.32	.26	-.22	.02	.13	.23	.30	.05	-.11	--			.30	.06	
10.Difficulty	.32	-.02	.19	.15	.55	.27	.34	-.09	-.14	.21	--		1.26	.16	
11.Emotionality	.47	.34	-.14	-.07	.25	.61	.65	-.25	-.40	.45	.23	--	.33	.21	

R^2=.58
Adj R^2=.44
F(11,32)=4.01, p<.001 R=.76

*p<.05. **p<.01. ***p<.001

Table 44

Standard Multiple Regressions on CIQ
After the Tests in Experiment 3

Test Three (n=42)

	DV	1	2	3	4	5	6	7	8	9	10	11	b	B	sr^2
1.TAI	.40	--											.00	.01	
2.HS	-.10	-.34	--										.03	.09	
3.Study	.26	-.02	.05	--									.06	.08	
4.Uncertainty	.74	.39	-.11	.39	--								.42	.18	
5.Conflict	.83	.43	-.24	.34	.80	--							1.24*	.49	.06
6.Helpless.	.65	.40	-.25	.10	.59	.63	--						.41	.19	
7.Control	.05	-.33	.05	.04	.03	.07	-.15	--					.33	.14	
8.Confidence	-.20	-.08	-.08	.10	-.09	-.09	-.27	.57	--				-.47	-.15	
9.Importance	.16	.25	-.25	.36	.28	.19	.24	-.06	.07	--			-.19	-.05	
10.Difficulty	.23	.11	.05	.35	.30	.25	.47	.01	-.15	.17	--		-.35	-.09	
11.Emotionality	.48	.58	-.16	-.07	.27	.34	.40	-.11	-.12	.23	.01	--	.13	.21	

R^2=.79
Adj R^2=.72
F(11,30)=10.41, p<.001
R=.89

Test Four (n=43)

	DV	1	2	3	4	5	6	7	8	9	10	11	b	B	sr^2
1.TAI	.61	--											.37***	.52	.17
2.HS	-.18	-.16	--										-.15	-.21	
3.Study	-.09	.23	-.08	--									-1.39**	-.37	.08
4.Uncertainty	.26	.31	.26	.04	--								-.27	-.06	
5.Conflict	.37	.38	.01	.18	.68	--							.14	.03	
6.Helpless.	.27	.27	.08	-.03	.56	.59	--						.28	.07	
7.Control	-.10	-.33	.10	.21	-.36	-.15	-.45	--					1.66*	.34	.07
8.Confidence	-.37	-.20	.13	.43	-.25	-.10	-.21	.35	--				-.40	-.07	
9.Importance	.25	.28	-.12	.35	.16	.23	.21	.04	.21	--			.36	.08	
10.Difficulty	.11	.10	.32	.11	.45	.35	.31	-.06	.24	.26	--		-.50	-.07	
11.Emotionality	.16	.46	.02	.16	.55	.53	.44	-.31	-.27	.30	.18	--	.75**	.49	.13

R^2=.70
Adj R^2=.59
F(11,29)=6.26, p<.001
R=.84

*p<.05. **p<.01. ***p<.001

Table 45

Standard Multiple Regressions on CIQ
After the Tests in Experiment 3

	Review Test (n=45)														
	DV	1	2	3	4	5	6	7	8	9	10	11	b	B	sr^2
1.TAI	.52	--											.21	.27	
2.HS	-.20	-.33	--										.01	.01	
3.Study	.18	.25	-.20	--									.15	.08	
4.Uncertainty	.20	.08	.06	.22	--								-.34	-.06	
5.Conflict	.50	.45	-.10	.35	.67	--							.94	.21	
6.Helpless.	.46	.34	-.18	.26	.68	.74	--						.24	.06	
7.Control	-.19	-.24	.10	.03	-.37	-.35	-.52	--					-.17	-.03	
8.Confidence	.02	-.27	.11	-.23	-.33	-.34	-.35	.59	--				2.58*	.41	.09
9.Importance	.35	.37	-.20	.46	-.02	.29	.26	.03	-.12	--			.76	.13	
10.Difficulty	.06	.02	.18	.31	.36	.36	.17	.18	.08	.33	--		-.92	-.12	
11.Emotionality	.55	.43	-.16	.09	.52	.66	.73	-.59	-.44	.25	.04	--	.65*	.42	.05

R^2=.55
Adj R^2=.40
F(11,33)=3.64, p<.005 R=.74

*p<.05. **p<.01. ***p<.001

using the conservative F-test proposed by Tabachnick and Fidell (1983). Again, an examination of the zero order correlations indicated no variable consistently had significant correlations with off-task thoughts.

Test Performance. Five standard multiple regressions were computed between test performance as dependent variable and high school average, performance on the previous test, amount of time spent studying, TAI, and level of problem-focused and emotion-focused coping, off-task thoughts and emotionality as independent variables.

Results were that between 21% and 69% of the variance in test performance could be explained (see Tables 46 to 48). Individual variables made unique contributions on only two regressions. In both cases, emotion-focused coping and off-task thoughts were negatively related. Correlations larger than about .61 would be considered significant using the conservative F-test proposed by Tabachnick and Fidell (1983). An examination of the zero order correlations indicated that emotion-focused coping had the strongest relationship with performance. However, the zero-order correlation of emotion-focused coping with test performance was significant on only two of the five regressions. Contrary to expectations, past performance did not make a unique contribution and generally had moderate zero order correlations with present performance. Problem-focused coping did not have a consistent relationship with test performance.

Table 46

Standard Multiple Regressions on Performance on the Tests in Experiment 3

Test One (n=42)

	DV	1	2	3	4	5	6	7	8	b	B	sr^2
1.TAI	-.27	--								.04	.13	
2 Test Before	.41	-.41	--							.27	.28	
3.HS	.08	-.32	.38	--						-.04	-.14	
4.Problem.	.00	.00	-.11	-.07	--					.10	.15	
5.EMOT.	-.51	.44	-.30	-.30	.27	--				-.09	-.33	
6.CIQ	-.46	.63	-.39	-.15	.17	.58	--			-.07	-.17	
7.Emotionality	-.48	.46	-.44	-.25	.23	.57	.62	--		-.16	-.24	
8.Study	.06	.27	-.18	-.13	.23	.04	.24	.34	--	.25	.16	

R^2=.44
Adj R^2=.31
$F(8,33)=3.28$, $p<.005$ R=.67

Test Two (n=43)

	DV	1	2	3	4	5	6	7	8	b	B	sr^2
1.TAI	-.21	--								.09	.34	
2 Test Before	.43	-.45	--							.29	.22	
3.HS	.28	-.32	.24	--						.04	.17	
4.Problem.	-.14	.14	-.16	.02	--					.16	.27	
5.EMOT.	-.52	.40	-.41	-.23	.60	--				-.10	-.38	
6.CIQ	-.49	.62	-.47	-.10	.32	.64	--			-.13	-.32	
7.Emotionality	-.38	.34	-.22	-.13	.40	.42	.42	--		-.16	-.24	
8.Study	.04	.01	-.03	.18	-.31	-.29	-.08	-.03	--	-.02	-.02	

R^2=.48
Adj R^2=.36
$F(8,34)=3.99$, $p<.005$ R=.69

*p<.05. **p<.01. ***p<.001

Table 47

Standard Multiple Regressions on Performance on the Tests in Experiment 3

Test Three (n=40)

	DV	1	2	3	4	5	6	7	8	b	B	sr^2
1.TAI	-.45	--								-.03	-.15	
2 Test Before	.29	-.35	--							.04	.07	
3.HS	.34	-.34	.32	--						-.02	-.10	
4.Problem.	-.25	.33	-.29	-.21	--					-.08	-.19	
5.EMOT.	-.77	.41	-.27	-.45	.29	--				-.32***	.78	.26
6.CIQ	-.25	.39	-.21	-.10	.74	.46	--			.19*	.41	.05
7.Emotionality	-.58	.61	-.22	-.16	.46	.60	.53	--		-.04	-.15	
8.Study	.04	-.02	.12	.05	.23	-.02	.28	-.05	--	-.02	-.06	

R^2=.68
Adj R^2=.60
$F(8,31)=8.41$, $p<.001$ R=.83

Test Four (n=41)

	DV	1	2	3	4	5	6	7	8	b	B	sr^2
1.TAI	.04	--								.06	.20	
2 Test Before	.36	.21	--							.43	.26	
3.HS	.20	-.16	.04	--						.07	.12	
4.Problem.	.07	.19	-.07	.10	--					.09	.15	
5.EMOT.	-.32	.41	-.22	-.14	.47	--				-.08	-.25	
6.CIQ	-.34	.61	-.12	-.18	.19	.55	--			-.14	-.33	
7.Emotional.	-.05	.46	-.13	.02	.21	.22	.61	--		.06	.08	
8.Study	.26	.23	-.14	-.08	.27	.10	-.09	.16	--	.33	.20	

R^2=.37
Adj R^2=.21
$F(8,32)=2.36$, $p<.05$ R=.61

*p<.05. **p<.01. ***p<.001

Table 48

Standard Multiple Regressions on Performance on the Tests in Experiment 3

		Review Test (n=44)										
	DV	1	2	3	4	5	6	7	8	b	B	sr^2
1.TAI	-.23	--								.11**	.32	.06
2 Test Before	.58	-.38	--							.21	.19	
3.HS	.37	-.33	.33	--						.05	.16	
4.Problem.	-.25	.22	-.08	-.16	--					.08	.10	
5.EMOT.	-.76	.53	-.51	-.34	.51	--				-.19***	-.62	.11
6.CIQ	-.65	.51	-.55	-.18	.35	.74	--			-.15*	-.33	.03
7.Emotional.	-.15	.43	-.33	-.15	.39	.35	.55	--		.11	.16	
8.Study	-.27	.25	-.29	-.21	.07	.25	.20	.09	--	-.05	-.07	

R^2=.75

Adj R^2=.69

$F(8,35)=13.12$, $p<.001$ R=.87

*p<.05. **p<.01. ***p<.001

Discussion

It appears that both emotionality and off-task thoughts were related to variables in the stress and coping model. Although a significant amount of variance was explained for both variables, most of this variance was attributable to shared variance. However, a conservative F-test used to examine the zero-order correlations, revealed very few significant correlations. Test anxiety was positively related to emotionality and, in contrast to Experiment 1, to the level of off-task thoughts.

Finally, a large proportion of the variance in test performance was related to variance shared among the variables in the model. On two regressions, subjects who reported having a greater number of off-task thoughts and using more emotion-focused coping strategies, did more poorly on the test. Past performance had only low or moderate correlations with performance and problem-focused coping was not related.

Discussion

Experiment 3 examined the cognitive appraisals and coping of students during in-class tests. A naturalistic setting is different from a lab setting and the experimenter cannot have as much control in a naturalistic setting as is available in a lab setting. However, the naturalistic setting does allow the examination of subjects' typical responses to stressful events that do occur in their lives, which a lab setting cannot completely replicate. Despite the differences in setting, there are some similarities between the results of Experiment 3 and those found in the previous experiments.

Consistent with theory and similar to Experiments 1 and 2, students' cognitive appraisals and emotion-focused coping changed in response to the demands of the task. On the review test, which required the mastery of material for a whole term, students did more poorly, indicating that this test was more difficult than the others. Furthermore, before writing the review test, students believed it would be more difficult than the others. Similar to the results of Liebert and Morris (1967), students were significantly more worried before this test than the others, indicating that they were more concerned about their performance on this test than on the others. The relatively greater demands of this more difficult test produced higher

levels of stress, threat and challenge, both before and after, compared to the other tests. Furthermore, the students responded to these demands by using more emotion-focused coping to manage their emotions. Challenge appraisals in this experiment and Experiment 2, both of which were in a naturalistic setting, in contrast to Experiment 1, the lab setting, responded in a manner that is consistent with stress and coping theory.

As in Experiment 1, a significant amount of variance in the dependent measures was accounted for by shared variance. However, unlike Experiment 1, the interrelationship of appraisals, emotions, and coping in Experiment 3 were not as clear or as consistent. As in Experiment 1, when appraising the stressfulness of a test, the level of threat and emotionality were almost always considered. In contrast, for threat, although a significant amount of variance was explained by shared variance, which was similar to Experiment 1, the zero-order correlations of emotionality, uncertainty, conflict/confusion, and helplessness with threat were not as highly related. For example, although the zero-order correlations of helplessness with threat were almost always the highest, they reached significance on only three of the five regressions. Here, unlike Experiment 1, level of challenge was not related to importance or difficulty.

However, consistent with expectation and similar to the results of Experiment 1, increased use of emotion-focused coping was related to increases in off-task thoughts and, to a lesser degree, to problem-

focused coping. As was the case in Experiment 1, problem-focused coping for the most part was not related to variables measured in Experiment 3. Secondary appraisals were not related to emotionality and off-tasks thoughts, as they were in Experiment 1. However, emotionality and test anxiety did tend to be positively related to the amount of off-task thoughts.

In contrast to Experiment 1, but consistent with the hypothesis, emotion-focused coping and off-task thoughts were negatively related to performance on two regressions. Although the correlations did not reach significance on the conservative F-test, on two other regressions, emotion-focused coping had the highest zero-order correlations with test performance. This negative relationship between performance and emotion-focused coping is similar to the results of Forsythe and Compas (1987), Zatz and Chassin (1985) and Vella (1984). In contrast, neither past performance nor problem-focused coping were related to current performance. The lack of relationship between past and current performance is contrary to theory and to the results of Experiment 1. Although it was predicted that problem-focused coping would be related to current performance, given the similarities of the demands of the tests, it is not surprising that there is no relationship between problem-focused coping and performance. All tests are multiple-choice and are administered by computer and it is likely that the multiple-choice format allows for only a limited range of problem-focused coping strategies, which all students would need to

complete the tests. Furthermore, Zatz and Chassin (1985) also reported finding no relationship between problem-focused coping and current performance.

When writing a review test, compared to when writing other in-class tests, students did more poorly and appraised that review test as being more difficult. Moreover, students appraised the review test as being more stressful, threatening, challenging, and worrisome, but not more emotionally arousing. They also used more emotion-focused coping on the review test than on the other tests. These results are consistent with stress and coping theory and similar to the results of Experiments 1 and 2. However, there was considerable difficulty replicating the results of Experiment 1 concerning the interrelationships of variables in the model. Although the proportion of variance explained by the variables was similar, in Experiment 3 more of the variance was attributed to shared variance. Furthermore, very few of the zero-order correlations, which would help explain the nature of the shared variance, reached significance on a conservative F-test. Although the intercorrelations were somewhat smaller, many of the patterns were similar. For example, the secondary appraisals of uncertainty, conflict/confusion, and helplessness tended to have moderate to high zero-order correlations with threat and emotionality.

There are at least two possible reasons for the failure of this experiment to completely replicate Experiment 1. This experiment, unlike Experiment 1, was conducted in a naturalistic setting where

there is much less opportunity to control the variables. For example, in Experiment 1 none of the subjects had any prior knowledge of the specific content of the math tests. Furthermore, because it was a lab experiment, no student would have any reason to study. In contrast, in this experiment the material covered by the tests was a part of the course. The students would know, through their experience with the material, which tests would be more difficult and for which they would have to study more. Two variables that are important to the appraisal process, perceived difficulty and problem-focused coping (studying) were not controlled for. This introduces a degree of complexity that was not present in Experiment 1.

Another factor is sample size. In this experiment there were only 46 subjects. This is particularly a problem for the regression analysis. The subject-to-variable ratio in this experiment only met the minimum requirement and, because most of the explained variance was related to shared variance, an examination of the zero-order correlations was important. However, because the F-test recommended by Tabachnick and Fidell (1983) takes into account the number of subjects, very few of the zero-order correlations met the criterion.

Chapter 8

GENERAL DISCUSSION

A test or exam is an ideal event through which to examine the efficacy of the stress and coping model. A test is a time-limited transaction between a person and an event. To a large extent, the objective demands of the task are identical for all subjects, and task variables can be easily controlled and manipulated. Conversely, the factors that each person brings to the test are different. The first part of Experiment 1 and 3 examined the effects of objective differences in the stressful event on cognitive appraisals and coping. The second part examined the relationships among appraisals, coping and performance. Experiment 2 examined only the effects of objective differences.

Methodological Issues

Although the present research provides support for the use of the stress and coping model for explaining the role of appraisals and emotions in test situations, it must be evaluated within the broader context of the experimental assumptions that are made in psychological research in general, and in the stress and coping literature in

particular. In most areas of research, there is controversy with respect to theory and measurement. The stress and coping literature is no exception. Research in stress and coping has not yet reached a point where there is a consensus concerning issues of definition or measurement (Appley & Trumbull, 1986; Eichler, Silverman & Pratt, 1986; Golberger & Breznitz, 1982; Spielberger & Sarason, 1986).

There are three major types of definitions of stress; stimulus (e.g., Holmes & Rahe, 1967), response (e.g., Selye, 1976), and relational (e.g., Lazarus & Folkman, 1984). Moreover, researchers in each of these areas use different measures to demonstrate the existence of stress.

Selye (1976) created the word "stressor" to label the noxious stimuli or causal agents that produced the stress response and defined stress as the nonspecific response of the body to any demand (the GAS). Selye's definition of stress was physiological, but in later work (Selye, 1976, 1979, 1982) he suggested that the major stressors for humans were psychological rather than physiological.

The definitions in the life-event literature were similar to those in Selye's model. Life events are defined as stressors and stress is an inferred internal state of the organism (Dohrenwend, 1986a 1986b). However, these theories are labeled as stimulus theories, because they emphasize the importance of the stressor (Dohrenwend, 1986b; Holmes & Masuda, 1974; Johnson & Sarason, 1979). These researchers (Dohrenwend & Dohrenwend, 1974; Holmes & Masuda,

1974; Rahe, 1974) argue that the greater the number of LCUs, the higher the probability of developing a physical or psychiatric illness. For the most part, the model does not consider individual differences in the way people interpret and react to different stressors, thus making no allowances for variables to intervene between the life event and its effect on the individual's response (Johnson & Sarason, 1979; Lazarus & Folkman, 1984; Perkins, 1982).

Neither stimulus nor response definitions have been very effective in explaining the relationship between the stressor and stress response (Appley & Trumbull, 1986; Lazarus & Folkman, 1984). Relational definitions, which include factors from both the environment and the person and highlight the importance of cognitive appraisals (Lazarus & Folkman, 1984), appear to offer a more promising line of research. However, the focus on cognitive appraisals, a psychological factor, and the transactional nature of the theory present other difficulties, some of which are outlined below.

Trumbull and Appley (1986) and Lazarus and Folkman (1984) argue that there are three levels of analysis (physiological, psychological and sociological): three parallel systems "that function to maintain a person and provide whatever means there are for dealing with stressors" (Trumbull & Appley, 1986, p. 22). Furthermore, they argue that within each level there are sub-levels or subsystems that must be understood and accounted for. For example, within the physiological level "one can identify circulation, respiration, glandular, nervous,

and digestive subsystems" (Trumbull & Appley, 1986, p. 22). Finally, they argue that " we must also be aware of the dynamic nature of such systems, their development, the underlying rhythms, and the ebb and flow of adjustments in their normal variations, from circadian to life cycles" (Trumbull & Appley, 1986, p. 22). A complete understanding of stress and coping will require an integrated theory that includes variables from all three levels. The goal of research in stress and coping is to determine the nature of the relationship of variables from each level with variables at the other levels.

Singer and Davidson (1986) conclude that although it is important to continue research that integrates the physiological and psychological levels, a number of problems are created by this attempted integration. They argue that neither physiological nor psychological variables are clearly defined. For example, they suggest that "although there has come to be some shared definition of the meaning of stress and stressor, terms such as variability, reactivity, and specificity have been confusing" (Singer and Davidson, 1986, p. 59). Furthermore, like Trumbull and Appley (1986) and Lazarus and Folkman (1984), they argue that there is not yet a good understanding of how the variables within each level interact and therefore, they conclude that it is premature to expect an understanding of how the variables from different levels should relate. For example, they note that new methods are still being developed to examine physiological responses in naturalistic settings and there is not yet agreement on

how to interpret the results. Finally, Singer (1986) argues that there is no systematic connection between the psychological and physiological levels in stress research and concludes that "for many of the important questions regarding the integration of stressor effects with physiological mechanisms we have neither the conceptual apparatus nor the empirical basis to start to frame sensible answers" (p.30).

The work of Frankenhaeuser (1986) is a good example of research that examines the relationship between physiological responses and psychosocial stressors. She is concerned with the effects of environmental factors on human health and behavior, with a special interest in "the health hazards associated with demands on human adaptation to the rapid rate of change in modern society" (Frankenhaeuser, 1986, p. 101). She states that "neuroendocrine responses to the psychosocial environment reflect its emotional impact on the individual. The emotional impact, in turn, is determined by the person's cognitive appraisal of the severity of the demands in relation to his or her own coping resources " (Frankenhaeuser, 1986, p. 101). Although she is primarily interested in physiological responses, Frankenhaeuser's theory concerning the relationship between physiological response and psychosocial stressor depends on cognitive appraisals and is very similar to Lazarus' model. She also outlines the development of the research linking hormones, which are physiological variables, and environmental demands. As with other

research in the stress and coping field, the research linking physiological responses and emotional and behavioral demands is still evolving. Early research investigated the response of only one hormone at a time in a lab setting. In contrast, most current research has focused on one of two adrenal systems; the sympathetic-adrenal-medullary system or the pituitary-adrenal-cortical system. But Frankenhaeuser hypothesizes that the two systems react differently to environmental demands and argues that research should investigate both systems simultaneously. Although this research is beyond the scope of this thesis, the way that Frankenhaeuser measured hormones is of theoretical interest. In naturalistic studies, urine samples are used to obtain measures of hormone levels. However, Frankenhaeuser states that this type of measurement does not reflect momentary changes, but assesses the total build-up over several hours. Because this measure does not reflect momentary changes in hormones, it cannot be used to test Lazarus' process model (Lazarus & Folkman, 1984). For example, in Experiment 3 it was demonstrated that stress and emotionality were lower after the tests than before, and that emotionality was related to stress. However, if urine samples had been obtained to represent physiological arousal, these samples would not have reflected the changes that were experienced and would not have been related to stress. Therefore, different conclusions would have been drawn about the relationship between stress and physiological arousal. Finally, although Frankenhaeuser is examining the interaction of two hormonal

systems, the hormonal subsystem is only one of several physiological subsystems, and knowledge concerning the interaction of the hormonal subsystem with other physiological subsystems is important.

Due to the lack of clarity concerning the interrelationship of variables within the physiological, psychological, and sociological levels, researchers are pursuing independent investigations at these three levels in an attempt to clarify the important interrelationships for each level. Lazarus and his colleagues (e.g., Lazarus & Folkman, 1984) and others (e.g., Trumbull & Appley, 1986) have focused on psychological factors and the role of cognitive appraisals. Lazarus and Folkman (1984) argue that an understanding of cognitive appraisals is the key to developing an understanding of the interrelationship of variables within one level with those at the other levels.

This concentration on internal cognitive events raises concerns about measurement. Most researchers rely on self-report measures to make inferences about the thoughts people experience. There is a long-standing debate about a subject's ability to access these inner thoughts (e.g., Clark, 1988; Gavanski & Hoffman, 1987; Nisbett & Wilson, 1977; Smith & Miller, 1978; Stokols, 1986). Although there are limitations to the introspective method, there is not yet a better way to evaluate thoughts and feelings. Nisbett and Wilson (1977), who take a most pessimistic view, argue that people do not have introspective access to their cognitive processes. They do, however, suggest that people have access to a large store of private knowledge. In fact, they state that:

> the individual knows a host of personal historical facts; he knows the focus of his attention at any given point in time; he knows what his current sensations are and has what almost all psychologists and philosophers would assert to be "knowledge" at least quantitatively superior to that of observers concerning his emotions, evaluations and plans. (pg. 255)

Others believe that there are occasions when people even have direct access to their cognitive processes. Smith and Miller (1978) suggest that people are more aware of the cognitive processes they use to solve difficult, novel tasks than those used to solve easy, well learned routines. Recent work by Gavanski and Hoffman (1987) also suggests that people possess privileged self-knowledge about factors that affect their judgments. However, even Nisbett and Wilson (1977) agree that subjects can provide self-reports concerning the cognitive appraisals they make, the emotions they experience, and the coping strategies they use.

With respect to the methods for accessing self-knowledge, Clark (1988) reviewed the literature concerning the validity of various measures of cognitions including recording, production, sampling, and endorsement methods. He concluded that research addressing the validity of cognitive measures is still in the exploratory stage. However, endorsement methods, by which subjects respond to questions about the presence of various thoughts, have the most evidence for validity. Specifically, endorsement methods "were able to differentiate between adjusted and maladjusted groups, were sensitive

to treatment effects, and evidenced a significant correlation with corresponding affective states whether measured by self-report or observer rating scales" (Clark, 1988, p. 14). The present thesis uses this means of obtaining information concerning subjects' thoughts and feelings.

Most measures in this thesis are concerned with the thoughts and feelings of subjects at the moment the questions are asked and therefore minimize problems of recall bias. When questions about thoughts and feelings could not be asked at the time they were experienced, subjects had to recall the thoughts and feelings experienced over a time span that was, at most, 20 minutes. According to Nisbett and Wilson (1977) the longer the time period, the greater the effect of recall bias. They argue that with delay, important factors may be forgotten or less available, and other factors may be included based on the availability heuristic. For example, if a student is asked to provide information about how he or she felt immediately after failing a test, Nisbett and Wilson (1977) argue that the student would be equally likely to remember both positive and negative feelings. However, if that student was asked a week later, Nisbett and Wilson argue that the student would "recall" feelings based on the availability heuristic about how he or she should have felt given the outcome. Therefore, more negative and fewer positive feelings would be recalled.

At this time, it is almost impossible to determine the psychometric adequacy of measures in the stress and coping field.

Researchers at all levels (physiological, psychological, social) recognize this problem and are still searching for reliable measures, which will respond predictably to different demands. If the self-report measures used in this thesis respond and are interrelated in a predictable manner, then it can be argued that they are valid. Furthermore, if it can be demonstrated that the variables respond predictably in different situations, this would strengthen the argument that they are valid measures. Lazarus and Folkman (1984) argue that researchers must establish stable, predictable relationships among self-report measures and then test these relationships with variables at the physiological level.

In general, the measures used in this thesis did respond as predicted to objective differences in the environment. Moreover, these differences were found in all three experiments. For example, stress, threat, worry, and emotionality responded as predicted in all three experiments. Furthermore, there was some evidence in both Experiment 1 and 3 that there was a consistent pattern of interactions between variables in the model. For example, threat and emotionality were almost always related to stress.

Summary

Experiment 1 was designed to test the stress and coping model in a controlled lab setting. One part of the experiment examined the effect of objective task difficulty on cognitive appraisals, emotions,

coping, and performance. The second part examined the interrelationships of variables in the model. It was demonstrated that subjects who wrote a five-minute test, compared to those who wrote a 10-minute test, appraised the test as being more stressful and threatening, were more worried and more physiologically aroused.

With respect to the interrelationship of the variables, a significant amount of variance in all variables, except problem-focused coping, was accounted for by the variables in the regression analyses. Furthermore, consistent with theory, a large proportion of the variance in most variables was related to shared variance. Threat and emotionality almost always made a unique contribution to the explanation of variance in stress. Except for the consistent unique contribution made by emotionality, almost all of the variance explained in threat was related to shared variance. Uncertainty, conflict/confusion, and helplessness did not make significant unique contributions, but the nature of the relationship among these variables and with threat suggest that they were largely responsible for the shared variance. Most of the explained variance in challenge was also related to shared variance with only importance and perceived task difficulty making relatively consistent unique contributions.

Conflict/confusion, importance and test anxiety were almost always related to emotionality. In turn, emotionality and the secondary appraisal of conflict/confusion were related to off-task thoughts. However, the variables in the model did not contribute

significantly to the explanation of variance in problem-focused coping. In contrast, a significant amount of the variance in emotion-focused coping was related to problem-focused coping and to off-task thoughts experienced during the tests. Finally, a significant amount of variance in test performance was related to ability measures, but not to appraisals, emotions, or coping.

Experiment 2 was designed to compare the cognitive appraisals of students on two math tests taken in a lab with those of the same students during university exams. As predicted, the students appraised the exams as being more difficult, important, stressful, threatening, and challenging than the math tests.

Finally, Experiment 3 was designed to replicate the results of Experiment 1 in a naturalistic setting. The cognitive appraisals, emotions, coping, and performance of students on a review test, which covered the work of an entire term, was compared to that of the same students on four other in-class tests, each of which covered only one week's work. The results of Experiment 3 provide limited support for the results of Experiment 1. Comparisons across the tests were similar to the results of Experiment 1, but the interrelationships of the variables in Experiment 3 were not as strong as those in Experiment 1.

As in Experiment 1, on the review test, which required the mastery of material for a whole term, students did more poorly and perceived it as significantly more difficult than tests which covered the work of only one week. Furthermore, students reported higher

levels of stress, threat and challenge, and higher levels of worry and emotion-focused coping on the review test, compared to the other tests. Finally, as in Experiment 2, levels of stress, threat, challenge, worry and emotionality decreased after all tests.

In general, the regression analyses did not replicate those in Experiment 1, but there was still some support for the model. As in Experiment 1, a significant proportion of the variance in all variables, except problem-focused coping, could be accounted for. However, in Experiment 3, a larger proportion of the variance was related to shared variance. Similar to the results of Experiment 1, on the regressions with stress as the dependent variable, threat and emotionality almost always made unique contributions. Moreover, problem-focused coping and off-task thoughts were related to emotion-focused coping. Also similar to Experiment 1, the variance in problem-focused coping was not consistently accounted for. In contrast to Experiment 1, on the regressions with threat as the dependent variable, no variables consistently made significant unique contributions. For challenge, only a small proportion of variance could be explained and, unlike Experiment 1, no variables made a consistent unique contribution. A significant amount of the variance in both emotionality and off-task thoughts was explained, but most of this variance was attributable to shared variance. Finally, a large proportion of the variance in test performance was related to shared variance, but, in contrast to Experiment 1, past performance was not related to current test performance.

Integration and Evaluation of the Stress and Coping Model and the Results of this Thesis

Tests and exams are stressful events, and therefore can be described using Lazarus' stress and coping model. Most of us, at one time or another, have been faced with the experience of writing exams. Exams are designed to test the limits of our mastery of newly learned material. Many skills (e.g., test-taking skills) in addition to the ability to learn this material are required to demonstrate that the material has been acquired. All of these skills must be applied to ensure optimum performance. According to the model, the role of cognitive appraisal is to: 1) evaluate the importance of the exam; 2) evaluate the difficulty of the exam in relation to the skills or coping strategies that are available and; 3) monitor the use of these coping strategies.

There are at least two differences between Experiment 1 and Experiment 3 that limit the conclusions that can be drawn from this research. Experiment 1 was conducted in a lab and Experiment 3 was conducted in a natural setting. When results from the two experiments are similar, this lends strong support to the model. However, when the results are different, there are at least two possible explanations. It could be that the model is incorrect, or there could be limitations in the experiment. For example, the lab setting gives the experimenter greater control of factors that might influence the appraisal process,

but it cannot truly replicate the conditions of the natural environment. Regardless of how noxious a stimulus may be, subjects know that they do not have to participate in the experiment and, therefore, have a degree of control not available in the natural environment. In contrast, the naturalistic setting limits the amount of control an experimenter has and introduces a greater possibility for confounding variables.

A second major limitation is the sample size in Experiment 3. The relatively small number of subjects in Experiment 3 met only the minimum requirement for the subject-to-variable ratio suggested by Tabachnick and Fidell (1983). Therefore, a conservative F-test, which adjusts for the subject-to-variable ratio, produced non-significant results on many zero-order correlations that were larger than .5. This limits the conclusions that can be drawn concerning the nature of the shared variance, which was a large proportion of most regressions. The greatest discrepancies between Experiment 1 and 3 appeared on these regressions and, for the most part, the results of the regressions in Experiment 3 produced larger proportions of shared variance and fewer significant zero-order correlations. Despite the fact that there were very few significant zero-order correlations on the regressions in Experiment 3, the pattern of interrelations were similar to Experiment 1. Even given these reservations, the results of this thesis offer support for Lazarus' stress and coping model.

According to Lazarus (Folkman & Lazarus, 1985), certain conditions must be met before an exam is appraised as stressful. To

begin with, the individual must have a stake in the outcome; that is, it must be important. Importance, therefore, is a necessary, but not sufficient, condition for an exam to be appraised as stressful. There is only limited support in the results of this study for the role of importance as a factor in the appraisal process. On simulated tests, as predicted, the more important a test was perceived to be, the higher the level of emotional arousal and the greater the challenge. In contrast, on the in-class tests, importance was not directly related to stress, threat, challenge or emotionality. This is not consistent with stress and coping theory and presents a problem for the model. However, all the in-class tests had mean importance scores above five on a seven-point scale, indicating that the tests were appraised as being quite important. It is possible that importance does not contribute directly to stress appraisals, but is mediated by its relationship with other variables. Sample size also could have contributed to the lack of relationship between importance and primary appraisals. In fact, the zero-order correlations between importance and primary appraisals range from around .4 to .5.

The model argues that if the student has a stake in the exam, the demands of the task will then be appraised in relation to the student's abilities. The degree of stress and the appraisals of threat and challenge are, therefore, determined by the objective difficulty of the test in relation to the ability of the person to succeed. Situation factors such as objective test difficulty and person factors

such as intelligence, effort, study skills and test-taking skills are considered when the person is making a secondary appraisal to determine whether adequate coping strategies are available to complete the exam successfully.

The present results strongly support the hypothesis that the primary appraisals people make are responsive to differences in objective test difficulty. Even very small increases in the level of difficulty, such as decreasing the time provided to complete a test, produce higher levels of stress, threat and emotionality. Moreover, there is some consistency in the cognitive process for appraising different testing situations.

According to Lazarus, students appraise the stressfulness of a test with attention to environmental factors (e.g., time to write the test, amount of material covered) and person factors (e.g., time spent studying, test-taking skills). Evidence from Experiment 1 shows that when the information from the environment is the same, groups that are comparable on measures of ability and anxiety make comparable appraisals of the stressfulness of the test. Moreover, when there is divergent information, in this case, the length of time to complete the test, the appraisals of the two groups reflect this difference: Students who wrote a five-minute test appraised it as being more stressful and threatening than those who wrote the same test in 10 minutes. This suggests that students respond to cues from the environment, specifically the length of time provided to complete a

test, when making their appraisals.

Other environmental factors, such as amount of material covered in each test (Experiment 3), also affect the appraisal process. When students know they are to write a test that covers the whole term, as opposed to only one week's work, they believe it will be more difficult and appraise this test as more stressful and threatening. Performance on this test is lower than on the other tests, and after it is over students continue to appraise the test as having been more stressful and threatening than the other tests. The results from both Experiment 1 and 3 support the hypothesis of the stress and coping model that people are sensitive to cues from the environment when appraising the stressfulness of a situation.

Unlike stress and threat, the primary appraisal of challenge did not relate to other factors in the model as expected. For example, it was not related to stress in either Experiment 1 or 3. Moreover, in both Experiments 1 and 3, less than 40% of the variance was explained, and this variance was related to perceived difficulty and importance only in Experiment 1. Folkman and Lazarus (1985) questioned the reliability of their measure of challenge appraisals and subsequent research by these authors has not explored its relationship with other variables. The results of this thesis and those of Folkman and Lazarus (1985) bring into question the validity of this construct.

Even when the environmental cues are the same, there are predictable individual differences in the way people appraise a test

or exam. For example, individuals who were physiologically aroused and felt threatened almost always felt stressed. These and other interrelationships give some support to the role played by person factors in the appraisal process. However, as predicted, and consistent with stress and coping theory, there is much overlap between the variables in the model, and most of the variance explained for each dependent variable is related to shared variance. Lazarus and Folkman (1986) state that "stress is an 'unclean' concept in that it depends on the interaction, over time, of two complex systems, the environment and the person. There is no way to separate them without destroying the concept of stress as a relational and cognitively mediated phenomenon" (p. 52). Furthermore, they argue that "much of the confounding between variables in stress research reflects the fusion of variables in nature rather than being merely the result of measurement errors of researchers" (p. 52). This does, however, make it difficult to clarify the interrelationships of these variables. Regardless, there is evidence in this thesis to suggest that there are some consistent interrelationships of the variables in the model. For example, level of stress is almost always related to threat and emotionality in both lab and naturalistic settings. Moreover, as predicted by the theory, these two variables are clearly related to the secondary appraisals of conflict/confusion, helplessness, and uncertainty in the lab setting. However, in the naturalistic setting this relationship is not as evident. Although there is some indication

that these secondary appraisals are related to threat, the correlations are not significant. There are at least two possible reasons for this. One is the effect of sample size on the significance level of the zero-order correlations. Because of the relatively small sample size in Experiment 3, moderate (about .5) and even high (about .7) zero-order correlations were not significant using a conservative F-test. Another is due to the relatively large correlations between conflict/confusion, helplessness, and uncertainty. Although the correlations are not large enough to invalidate the analysis due to multicollinearity, there is still a problem. According to Pedhazur (1982) and Tabachnick and Fidell (1983), high intercorrelations among independent variables produce larger standard error of regression coefficients and result in a lower probability of finding significant unique contributions. Furthermore, Pedhazur (1982) argues that when more than one variable is used to represent an important construct, the variables will split the variance that is attributable to that construct. Therefore, if conflict/confusion, helplessness, and uncertainty represent the same underlying appraisal, a single measure would have been more likely to make a consistent unique contribution to the explanation of variance in threat. However, Lazarus' theory suggests that they are distinct, but overlapping constructs. Therefore, theoretically it is important to continue to use the three distinct variables.

According to Lazarus, emotions are composed of physiological arousal, cognitive appraisals and coping. Emotionality, which represents a person's physiological arousal, is strongly related to both primary and secondary appraisals and to emotion-focused coping in the lab setting, indicating that emotional arousal is an integral part of the appraisal process. As is the case of threat, the relationship of emotionality with other variables is not as large in the naturalistic setting. Although not significant, the relationship of emotionality with other variables in Experiment 3 was similar to the relationship in Experiment 1. According to theory, the relationship of emotions with appraisals is bidirectional. Although the present data are correlational, they are consistent with the position that when secondary appraisals indicate that coping strategies are not adequate to meet the demands of a task, increases in physiological arousal will result. This higher level of physiological arousal will, in turn, lead to higher levels of threat and stress.

Lazarus (Lazarus & Folkman, 1984) considers a stable personality disposition to be similar to a stable belief. In this thesis, the stable beliefs related to test anxiety were positively related to emotional arousal in Experiment 1 and to both emotional arousal and off-task thoughts in Experiment 3. However, as predicted, test anxiety had no direct relationship with the primary appraisals of stress and threat or with performance. Previous research has shown test anxiety to be related to off-task thoughts (e.g., Galassi, Frierson, & Sharer,

1981). Moreover, the relationship of test anxiety to emotional arousal and off-task thoughts is consistent with theory in the test anxiety literature (Wine, 1971, 1980), which defines test anxiety as being composed of cognitive concern and emotional arousal. However, there have been contradictory results concerning the relationship between test anxiety and emotional arousal. For example, Hollandsworth et al. (1979) found that low test-anxious students had higher levels of physiological arousal than high test-anxious students. They measured heart rate and respiratory rate and argued that low test-anxious subjects were able to interpret this arousal positively. In contrast, Deffenbacher (1986) found that high test-anxious subjects had higher pulse rates and that emotionality was related to test anxiety.

Although Vella (1984) found a significant relationship between test anxiety and stress and threat, it was predicted that in this thesis test anxiety would not be directly related to these variables. It was argued that although stable beliefs do affect the appraisal process, environmental and person factors more immediately related to the appraisal process would explain significantly more variance in stress and threat. This was indeed the case. Finally, the absence of a relationship between test anxiety and performance is consistent with theory and similar to the results reported by others (e.g., Bruch, 1981).

The relationship of coping to other variables in the model presents some problems. With respect to emotion-focused coping,

subjects reported using more emotion-focused coping on the more difficult test for in-class tests, but not for simulated tests. This inconsistency may be because the lab test is not particularly important and does not raise emotionality to a level that interferes with performance; therefore, subjects do not need to use more emotion-focused coping. In fact, an examination of the means indicated that emotionality was higher on all tests in Experiment 3 than in Experiment 1. Emotion-focused coping was negatively related to performance on only two of the five in-class tests. However, on two others the correlations, although not significant were about -.5, indicating that there may be a relationship. Previous research (Forsythe & Compas, 1987; Vella, 1984; Zatz & Chassin, 1985) has demonstrated a negative relationship between emotion-focused coping and performance.

In contrast, it appears that the differing demands of the tests are not sufficient to affect problem-focused coping on either simulated or in-class tests. Moreover, problem-focused coping is not related to any variables on the simulated tests and is related to others on only two of the in-class tests. Problem-focused coping is hypothesized to be more related to task demands than to person factors (Lazarus & Folkman, 1984). In previous experiments (e.g., Folkman & Lazarus, 1980), comparisons regarding problem-focused coping were made across types of situations (e.g., work vs. home) and not within situations. There is a great deal of similarity in the demands across

the tests within each of the experiments; this might account for the lack of relationship between problem-focused coping and other variables in the model. A tentative conclusion can be drawn that problem-focused coping does not differ from test to test.

Neither problem-focused coping nor past performance is related to present performance on in-class tests. This is inconsistent with theory and somewhat puzzling. However, the absence of a relationship between problem-focused coping and performance has occurred previously (Zatz & Chassin, 1985). There are several possible reasons for the absence of a relationship between problem-focused coping and performance. Changes from one strategy to another may be related to factors other than the failure of a particular strategy to be effective. The R-WOC questionnaire does not measure the effectiveness of strategies and is broad-based. It may also be that the problem-focused coping strategies measured by the R-WOC do not adequately cover the strategies that are needed. Lazarus and Folkman (1984) argue that both general problem-solving skills and specific skills are a part of the repertoire included in problem-focused coping. Furthermore, they argue that specific skills will be more predictive of outcome than general skills. The R-WOC measures general problem-solving skills, but not test-taking skills. Future research may need to measure more specific skills to evaluate the relationship of coping with other variables in the model.

There are other problems with the R-WOC that could account for the absence of a relationship between problem-focused coping and

performance. Coping is not defined by success and, therefore, people can use both successful and unsuccessful coping strategies. Moreover, the factors are constructed by summing the items in the scale. Each item is scored on a four-point Likert scale. Therefore, there are at least four possible ways people could get the same score on a coping scale, yet each would have a very different meaning for outcome. For example, they could: 1) use a few effective strategies frequently; 2) use a few ineffective strategies frequently; 3) use many effective strategies infrequently and; 4) use many ineffective strategies infrequently. Each of these combinations would yield the same score on a factor, but would lead to very different outcomes. Studies that measure the effectiveness of coping strategies (Lamping, 1986a, 1986b, 1987) may help to understand the relationship between coping and outcome.

Finally, each strategy measured by the R-WOC may have a different impact on outcome. Therefore, a composite measure of coping would disguise the relationship between particular strategies and performance. To determine if individual strategies are related to performance, it may be necessary to measure and analyze each strategy separately and forgo the use of composite measures.

There is also some inconsistency in the relationship between current and past performance. On the simulated tests, past performance is strongly related to present performance, whereas on the in-class tests, past performance is at best moderately related. One possible

cause of the difference relates to setting (lab vs. naturalistic): Outcome can be affected by a combination of many person and environmental factors and there is considerably more variation in the conditions related to the in-class tests compared to the lab tests. For example, the lab setting is more controlled, which eliminates some variables such as the opportunity to study. Therefore, because there are fewer variables that affect the outcome of the lab tests, compared to the in-class tests, it is perhaps not surprising that past performance plays a larger role. Furthermore, in the lab setting, the tests are not as important or as difficult as the in-class tests and, therefore are not as stressful or as emotionally arousing, and there were fewer off-task thoughts, and less emotion-focused coping. Students' appraisals in Experiment 1 indicate that the tests were within their range of competence and that they did not need to use many emotion-focused coping strategies to redirect their attention to the task. Therefore, these factors did not have as great an impact on performance. This suggests that subjects' performance would be more directly related to math abilities.

Future Directions

There are at least two areas of concern for future research; one is related to problems general to the stress and coping literature and the other is related problems specific to Lazarus' stress and

coping theory. To begin with, it has been argued that researchers in the stress and coping field have not yet agreed on how to define or measure stress (e.g., Appley & Trumbull, 1986). Furthermore, variables at three levels of analysis (physiological, psychological and sociological) need to be clearly defined and measured (Trumbull & Appley, 1986). However, there is some agreement that relational definitions, which include factors from both the environment and the person are needed. A complete understanding of stress and coping cannot be reached until the same clear definitions are used by all researchers. Moreover, there is no consensus concerning how the variables at each level are related to variables at the other levels (Singer, 1986). However, there is a growing concensus that cognitive appraisals play an important role in stress and coping (e.g., Frankenhaeuser, 1986; Lazarus & Folkman, 1984). But these relationships cannot be clearly demonstrated until the variables can be measured reliably. Researchers at all three levels should continue to seek clear definitions and reliable measures for the variables at these levels. As these definitions and measures become more adequate, it will provide a better opportunity to develop and test an integrated model of stress and coping.

With respect to Lazarus' theory, this thesis provides support for the hypothesis that cognitive appraisals of stress and threat respond to the demands of the environment. However, there is less support for the predicted interrelationships of variables in the

model. For example, there does not appear to be a relationship between present performance and problem-focused coping. Furthermore, problem-focused coping does not appear to be related to secondary appraisals. The lack of relationship between problem-focused coping and other variables in the model is a serious problem. However, at this point it is unclear if the difficulty it related to the theory or the measure. Further research is needed to examine the adequacy of the R-WOC for assessing coping during tests, and to compare the R-WOC to alternative methods. For example, it may be that measures assessing test-taking skills provide a better understanding of how people cope with tests and exams.

The relationship between primary and secondary appraisals and coping also needs to be clarified. Although some support was found for the utility of the secondary appraisals of helplessness, conflict/confusion, and uncertainty, the secondary appraisals of control and confidence did not appear to be related to others variables.

Future research should also continue to use both lab and naturalistic settings to test hypotheses generated from the transactional model of stress and coping. However, in naturalistic settings care must be taken to ensure that the sample size is large enough to adequately test the hypotheses. Finally, because there are some interrelationships which have some predictability, it is appropriate to begin to use hierarchical regression to test these

hypothesized relationships.

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Appendix A

Consent Form, Self-Report Measures and Math Test

McMASTER UNIVERSITY
Department of Psychology
1280 Main Street West, Hamilton, Ontario, L8S 4K1
Telephone: 525-9140 Local 4345

Study on a Testing Situation

Subject Consent Form

I agree to participate in a research study on the thoughts and feelings students have during a testing situation. I understand that my participation will involve completing a series of standard personality questionnaires and taking a test of mathematical ability. In addition, the scores from the personality assessment methods demonstration conducted in class will be used as data.

I understand that all information will be confidential and that a study number rather than my name will be used on all data. These data will be kept in research files and will not be available to anyone other than project staff.

I further understand that I may ask questions about the study at any time and that I am free to withdraw consent and discontinue participation at any time. My cooperation is completely voluntary and there will be no penalty or prejudice should I decide to withdraw consent.

I will receive credit for fulfilling the research practicum option of Psychology 2B3 and will also receive up to $5.00 for bonus points obtained on the test. Should I decide to withdraw from the experiment at any point, I will be required to fulfill the research report option instead.

I have read the above information and have had all my questions adequately answered. I agree to participate in this research study.

Signed _____

Date _____

Principal Investigator:
Barry Benness

Supervised by:
Dr. D. Lamping

NAME: _____

Math Subtest of the WRAT

Written Part

$43 + 6$

$94 - 64$

$\$4.95 \times 3$

$726 - 349$

$2\frac{1}{2} + 1\frac{1}{2} =$ _____

$\frac{1}{6}$ of 30 = _____

$229 + 5048 + 63 + 1381$

$9\overline{)4527}$

$1\frac{1}{3}$ ft. = _____ in.

$2 -$ _____ $= \frac{1}{4}$

Add: $6\frac{1}{4} + 1\frac{5}{8} + 4\frac{1}{2}$

809×47

Write as percent:

.42 = _____ %

Subtract: $10\frac{1}{4} - 7\frac{2}{3}$

Multiply: 6.23×12.7

Find average:

34, 16, 45, 39, 27

Ans._____

Write as decimal:

$52\frac{1}{2}\%$ = _____

Write as percent:

$\frac{3}{8}$ = _____ %

$2.9\overline{)308.85}$

Add: 3 ft. 6 in.
5 ft. 5 in.
8 ft. 11 in.

M + 2 = 5
M = _____

2x = 3
x = _____

$6 \times 3\frac{7}{8} =$ _____

15% of 175 = _____

Write as common fraction in lowest terms: .075 = _____

The complement of an angle of 30° = _____

$4^3 =$ _____

.25 ÷ $1\frac{1}{5}$ = _____

If a = 7, b = 3;
$a^2 + 3b =$ _____

$\frac{1}{4}\%$ of 60 = _____

66 sq. ft. = _____ sq. yd.

Solve: $\frac{7 - (6 + 8)}{2} =$ _____

Add: $-x - y - 23$, $x - y + 22$

Factor: $r^2 + 25 - 10r$

Ans._____

$\frac{r^2 - 5r - 6}{r + 1}$

Ans._____

Change to familiar numerals:
M D C X C I = _____

Find interest on $1,200 at 6% for 70 days. Ans. _____

$3p - q = 10$
$2p - q = 7$
p = _____
q = _____

$\sqrt{2ax} = 6$
x = _____

$\frac{7}{17} = \frac{6}{x}$
x = _____

Find square root:

$\sqrt{67081}$

Ans_____

$\log_{10}\left(\frac{1}{100}\right)$

Ans._____

$\log_5 5\sqrt{5}$

Ans._____

Reduce: $\frac{k^2 + k}{k^2} \cdot \frac{3k - 3}{k^2 - 1}$

Ans._____

Find root:
$2x^2 - 36x = 162$

Ans_____

STAI X-2

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you generally feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

	Almost never	Some-times	Often	Almost always
1. I feel pleasant.	1	2	3	4
2. I tire quickly.	1	2	3	4
3. I feel like crying.	1	2	3	4
4. I wish I could be as happy as others seem to be.	1	2	3	4
5. I am losing out on things because I can't make up my mind soon enough.	1	2	3	4
6. I feel rested.	1	2	3	4
7. I am "calm, cool, and collected".	1	2	3	4
8. I feel that difficulties are piling up so that I cannot overcome them.	1	2	3	4
9. I worry too much over something that really doesn't matter.	1	2	3	4
10. I am happy.	1	2	3	4
11. I am inclined to take things hard.	1	2	3	4
12. I lack self-confidence.	1	2	3	4
13. I feel secure.	1	2	3	4
14. I try to avoid facing a major crisis or difficulty.	1	2	3	4

	Almost never	Some-times	Often	Almost always
15. I feel blue.	1	2	3	4
16. I am content.	1	2	3	4
17. Some unimportant thought runs through my mind and bothers me.	1	2	3	4
18. I take disappointments so keenly that I can't put them out of my mind.	1	2	3	4
19. I am a steady person.	1	2	3	4
20. I get in a state of tension or turmoil as I think over my recent concerns and interests.	1	2	3	4

SOL

Please circle the number on the scale which indicates your answer to the following questions.

1. In general, how stressful do you feel your life is?

Not at all 1 2 3 4 5 6 7 extremely

2. In general, when you are in a stressful situation, to what extent do you rely on either your own inner resources or on others when attempting to cope or deal with stress?

Myself 1 2 3 4 5 6 7 others

3. In general, how successful do you feel you are in coping or dealing with stressful events which happen in your life?

Not at all 1 2 3 4 5 6 7 extremely

Demographic Information

1. What is your subject number?_____

2. How old are you?_____

3. Are you a male or female?

   1=male
   2=female

4. What year are in?

   1
   2
   3
   4
   5

5. What faculty are you in?
   1= Arts
   2= Science
   3= Social Science
   4= Engineering
   5= Business
   6= other

6. What was your average last year
   1=A
   2=B
   3=C
   4=D
   5=F

7. What was your average in grade 13?

   1=A
   2=B
   3=C
   4=D
   5=F

8. How long has it been since your last math/stats course?

   0=this year
   1= 1 year
   2= 2 years
   3= 3 years
   4= 4 years
   5= 5 or more years

9. What was your average in your last math/stats course?

   1=A
   2=B
   3=C
   4=D
   5=F

10. What is your major?

    1= Psychology
    2= Math
    3= Engineering
    4= Computer Science
    5= Commerce
    6= Other Math related
    7= Other unrelated to math

STAI X-1

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you feel right now, that is, at this moment. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

	Not at all	Some-what	Moderately So	Very Much So
1. I feel calm.	1	2	3	4
2. I feel secure.	1	2	3	4
3. I am tense.	1	2	3	4
4. I am regretful.	1	2	3	4
5. I feel at ease.	1	2	3	4
6. I feel upset.	1	2	3	4
7. I am presently worrying over possible misfortunes.	1	2	3	4
8. I feel rested.	1	2	3	4
9. I feel anxious.	1	2	3	4
10. I feel comfortable.	1	2	3	4
11. I feel self-confident.	1	2	3	4
12. I feel nervous.	1	2	3	4
13. I feel jittery.	1	2	3	4
14. I feel "high strung".	1	2	3	4

	Not at all	Some-what	Moderately So	Very Much So
15. I am relaxed.	1	2	3	4
16. I feel content.	1	2	3	4
17. I am worried.	1	2	3	4
18. I feel over-excited and "rattled".	1	2	3	4
19. I feel joyful.	1	2	3	4
20. I feel pleasant.	1	2	3	4

TAI

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you generally feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

	Almost never	Some-times	Often	Almost always
1. I feel confident and relaxed while taking tests.	1	2	3	4
2. While taking examinations I have an uneasy, upset feeling.	1	2	3	4
3. Thinking about my grade in a course interferes with my work on tests.	1	2	3	4
4. I freeze up on important exams.	1	2	3	4
5. During exams I find myself thinking about whether I'll ever get through school.	1	2	3	4
6. The harder I work at taking a test, the more confused I get.	1	2	3	4
7. Thoughts of doing poorly interfere with my concentration on tests.	1	2	3	4
8. I feel very jittery when taking an important test.	1	2	3	4
9. Even when I'm well prepared for a test I feel very nervous about it.	1	2	3	4
10. I start feeling very uneasy just before getting a test paper back.	1	2	3	4
11. During test I feel very tense.	1	2	3	4

	Almost never	Some-times	Often	Almost always
12. I wish examinations did not bother me so much.	1	2	3	4
13. During important tests, I am so tense my stomach gets upset.	1	2	3	4
14. I seem to defeat myself while working on important tests.	1	2	3	4
15. I feel very panicky when I take an important exam.	1	2	3	4
16. I worry a great deal before taking an important examination.	1	2	3	4
17. During tests I find myself thinking about the consequences of failing.	1	2	3	4
18. I feel my heart beating very fast during important tests.	1	2	3	4
19. After an exam is over I try to stop worrying about it, but I just can't.	1	2	3	4
20. During examinations I get so nervous that I forget facts I really know.	1	2	3	4

MAS

Directions: The items in the questionnaire refer to things and experiences that may cause fear and apprehension. For each item circle the appropriate number that describes how much you are frightened by it nowadays. Work quickly but be sure to consider each item individually.

	Not At All	A Little	A Fair Amount	Much	Very Much
1. Thinking about an upcoming math test one day before.	1	2	3	4	5
2. Picking up a math textbook to begin a difficult reading assignment.	1	2	3	4	5
3. Opening a math or stat book and seeing a page full of problems.	1	2	3	4	5
4. Studying for a math test.	1	2	3	4	5
5. Thinking about an upcoming math test one week before.	1	2	3	4	5
6. Taking an examination (quiz) in a math course.	1	2	3	4	5
7. Listening to a lecture in a math class.	1	2	3	4	5
8. Starting a new chapter in a math book	1	2	3	4	5
9. Signing up for a math course.	1	2	3	4	5
10. Picking up a math textbook to begin working on a homework assignment.	1	2	3	4	5
11. Thinking about an upcoming math test one hour before.	1	2	3	4	5

	Not At All	A Little	A Fair Amount	Much	Very Much
12. Realizing that you have to take a certain number of math classes to fulfill the requirements in your major.	1	2	3	4	5
13. Not knowing the formula needed to solve a particular problem.	1	2	3	4	5
14. Taking the math section of a college entrance exam.	1	2	3	4	5
15. Being given a homework assignment of many difficult math problems which is due the next class.	1	2	3	4	5
16. Being given a "pop" quiz in a math class.	1	2	3	4	5
17. Listening to another student explain a math formula.	1	2	3	4	5
18. Working on an abstract mathematical problem, such as "If x=outstanding bills, and y=total income, calculate hoe much you have left for recreational expenditures".	1	2	3	4	5
19. Getting ready to study for a math test.	1	2	3	4	5
20. Hearing a friend try to teach you a math procedure and finding that you cannot understand what he is telling you.	1	2	3	4	5
21. Walking on campus and thinking about a math course.	1	2	3	4	5

	Not At All	A Little	A Fair Amount	Much	Very Much
22. Taking an examination (Final) in a math course.	1	2	3	4	5
23. Reading a formula in chemistry.	1	2	3	4	5
24. Watching a teacher work an algebraic equation on the blackboard.	1	2	3	4	5
25. Looking through the pages of a math text.	1	2	3	4	5
26. Solving a square root problem.	1	2	3	4	5
27. Walking into a math class.	1	2	3	4	5
28. Having to use the tables in the back of a math text.	1	2	3	4	5
29. Walking to math class.	1	2	3	4	5
30. Taking to someone in your class who does well about a problem and not being able to understand what he is explaining.	1	2	3	4	5
31. Thinking about an upcoming math test 5 minutes before.	1	2	3	4	5
32. Being asked to explain how you arrived at a particular solution for a problem.	1	2	3	4	5
33. Receiving your final math grade in the mail.	1	2	3	4	5
34. Reading and interpreting graphs and charts.	1	2	3	4	5
35. Tallying up the results of a survey or poll.	1	2	3	4	5

	Not At All	A Little	A Fair Amount	Much	Very Much
36. Doing a work problem in algebra.	1	2	3	4	5
37. Sitting in a math class and waiting for the instructor to arrive.	1	2	3	4	5
38. Being called upon to recite in a math class when you are prepared.	1	2	3	4	5
39. Buying a math textbook.	1	2	3	4	5
40. Asking your math instructor to help you with a problem that you don't understand.	1	2	3	4	5

WEQ

Directions: To the left of each of the following statements indicate your feelings, attitudes, and thoughts as they are right now in relation to this test. Use the following numerical scale.

1. The statement does not describe my present condition.
2. The statement is barely noticeable.
3. The statement is moderate.
4. The statement is strong.
5. The statement is very strong; the statement describes my present condition very well.

____ I feel my heart beating fast.

____ I feel regretful.

____ I am so tense that my stomach is upset.

____ I am afraid that I should have studied more for this test.

____ I have an uneasy, upset feeling.

____ I feel that others will be disappointed in me.

____ I am nervous.

____ I feel I may not do as well on this test as I could.

____ I feel panicky.

____ I do not feel very confident about my performance on this test.

CAQ

Directions: Please circle the number on the scale which indicates your answer to each of the following questions.

1. How stressful is this test situation at this point?

   Not at all 1 2 3 4 5 6 7 extremely

2. To what extent do you perceive this test as:

   i) a threat (e.g., physically and/or psychologically threatening)?

   Not at all 1 2 3 4 5 6 7 extremely

   ii) a challenge?

   Not at all 1 2 3 4 5 6 7 extremely

3. How uncertain or unsure do you feel about this test at this point?

   Not at all 1 2 3 4 5 6 7 extremely

4. How much conflict or confusion do you feel in the test situation at this point?

   Not at all 1 2 3 4 5 6 7 extremely

5. How helpless do you feel in this test situation at this point?

   Not at all 1 2 3 4 5 6 7 extremely

6. How much control do you feel over this test situation at this point?

   Not at all 1 2 3 4 5 6 7 extremely

7. How confident are you about your ability to cope or deal with the test situation at this point?

   Not at all 1 2 3 4 5 6 7 extremely

8. What is your best estimate of the grade you will get on this test?

_____

9. How confident are you of getting this grade?

Not at all 1 2 3 4 5 6 7 extremely

10. How important is the test for you at this point?

Not at all 1 2 3 4 5 6 7 extremely

11. What is your best estimate of the degree of difficulty of this test?

Not at all 1 2 3 4 5 6 7 extremely

CDS

To what extent do you feel your performance on the test will be/was influenced by EACH of the following factors?

	NOT AT ALL						EXTREMELY
1. General level of academic ability	1	2	3	4	5	6	7
2. Amount of effort/preparation for the test.	1	2	3	4	5	6	7
3. Luck	1	2	3	4	5	6	7
4. Difficulty of the test	1	2	3	4	5	6	7
5. Psychological state (e.g., mood, fatigue)	1	2	3	4	5	6	7
6. Grading of the test	1	2	3	4	5	6	7
7. General test-taking abilities	1	2	3	4	5	6	7
8. General study habits	1	2	3	4	5	6	7
9. Your ability to control your anxiety	1	2	3	4	5	6	7

CIQ

We are interested in learning about the kinds of thoughts that go through people's heads while they are working on a test. The following is a list of thoughts some of which you might have had while doing the test on which you have just worked. Please indicate approximately how often each thought occurred to you while working on it by placing the appropriate number from the scale below in the blank provided to the left of each question.

1	2	3	4	5
Never	Once	A few times	Often	Very Often

___ 1. I thought about how poorly I was doing.

___ 2. I thought about what the experimenter would think of me.

___ 3. I thought about how I should work more carefully.

___ 4. I thought about how much time I had left.

___ 5. I thought about how others have done on this test.

___ 6. I thought about the difficulty of the problem.

___ 7. I thought about my level of ability.

___ 8. I thought about the purpose of the test.

___ 9. I thought about how I would feel if I were told how I performed.

___ 10. I thought about how often I got confused.

___ 11. I thought about things completely unrelated to the test.

Please circle the number of the following scale which best represents the degree to which you felt your mind wandered during the test you have just completed.

1	2	3	4	5	6	7	8	9
Not at all								Very Much

R-WOC

Below is a list of ways people cope with a variety of stressful events. Please indicate by circling the appropriate number the strategies you used in dealing with the test you just took.

	Does not apply and/or not used	Used somewhat	Used quite a bit	Used a great deal
1. Just concentrated on what I had to do next - the next step	0	1	2	3
2. I tried to analyze the problem in order to understand it better.	0	1	2	3
3. Turned to work or substitute activity to take my mind off things.	0	1	2	3
4. I felt that time would make a difference - the only thing to do was wait.	0	1	2	3
5. Bargained or compromised to get something positive from the situation.	0	1	2	3
6. I did something which I didn't think would work, but at least I did something	0	1	2	3
7. Tried to get the person responsible to change his or her mind	0	1	2	3
8. Talked to someone to find out more about the situation.	0	1	2	3
9. Criticized or lectured myself.	0	1	2	3
10. Tried not to burn my bridges, but leave things open somewhat.	0	1	2	3
11. Hoped a miracle would happen.	0	1	2	3
12. Went along with fate; sometimes I just have bad luck.	0	1	2	3
13. Went on as if nothing had happened.	0	1	2	3

	Does not apply and/or not used	Used somewhat	Used quite a bit	Used a great deal
14. I tried to keep my feelings to myself.	0	1	2	3
15. Looked for the silver lining, so to speak; tried to look on the bright side	0	1	2	3
16. Slept more than usual.	0	1	2	3
17. I expressed anger to the person(s) who caused the problem.	0	1	2	3
18. Accepted sympathy and understanding from someone.	0	1	2	3
19. I told myself things that helped me feel better.	0	1	2	3
20. I was inspired to do something creative.	0	1	2	3
21. Tried to forget the whole thing.	0	1	2	3
22. I got professional help.	0	1	2	3
23. Changed or grew as a person in a good way	0	1	2	3
24. I waited to see what would happen before doing anything.	0	1	2	3
25. I apologized or did something to make up.	0	1	2	3
26. I made a plan of action and followed it.	0	1	2	3
27. I accepted the next best thing to what I wanted.	0	1	2	3
28. I let my feelings out somehow.	0	1	2	3
29. Realized I brought the problem on myself.	0	1	2	3

	Does not apply and/or not used	Used some-what	Used quite a bit	Used a great deal
30. I came out of the experience better than when I came in.	0	1	2	3
31. Talked to someone who could do something concrete about the problem.	0	1	2	3
32. Got away from it for a while; tried to rest or take a vacation.	0	1	2	3
33. Tried to make myself feel better by eating, drinking, smoking, using drugs or medication.	0	1	2	3
34. Took a big chance or did something very risky.	0	1	2	3
35. I tried not too act to hastily or follow my first hunch.	0	1	2	3
36. Found new faith.	0	1	2	3
37. Maintained my pride and kept a stiff upper lip.	0	1	2	3
38. Rediscovered what is important in life.	0	1	2	3
39. Changed something so things would turn out all right.	0	1	2	3
40. Avoided being with people in general.	0	1	2	3
41. Didn't let it get to me; refused to think about it.	0	1	2	3
42. I asked a relative or friend I respected for advice.	0	1	2	3
43. Kept others from knowing how bad things were.	0	1	2	3
44. Made light of the situation; refused to get too serious about it.	0	1	2	3

	Does not apply and/or not used	Used somewhat	Used quite a bit	Used a great deal
45. Talked to someone about how I was feeling.	0	1	2	3
46. Stood my ground and fought for what I wanted.	0	1	2	3
47. Took it out on other people.	0	1	2	3
48. Drew on my past experiences; I was in a similar situation before.	0	1	2	3
49. I knew what had to be done, so I doubled my efforts to make things work.	0	1	2	3
50. Refused to believe that it had happened.				
51. I made a promise to myself that next time things would be different.	0	1	2	3
52. Came up with a couple of solutions to the problem.	0	1	2	3
53. Accepted it, since nothing could be done.	0	1	2	3
54. I tried to keep my feelings from interfering with other things too much.	0	1	2	3
55. Wished that I could change what had happened or how I felt.	0	1	2	3
56. I changed something about myself.	0	1	2	3
57. I daydreamed or imagined a better time or place than the one I was in.	0	1	2	3
58. Wished that the situation would go away or somehow be over with.	0	1	2	3
59. Had fantasies or wishes about how things might turn out.	0	1	2	3

	Does not apply and/or not used	Used some-what	Used quite a bit	Used a great deal
60. I prayed.	0	1	2	3
61. I prepared myself for the worst.	0	1	2	3
62. I went over in my mind what I would say or do.	0	1	2	3
63. I thought about how a person I admire would handle this situation and used that as a model.	0	1	2	3
64. I tried to see things from the other person's point of view.	0	1	2	3
65. I reminded myself how much worse things could be.	0	1	2	3
66. I jogged or exercised.	0	1	2	3
67. I tried something entirely different from any of the above. (Please describe).	0	1	2	3

Addition

1 $6.0 + 0.813 + 12.65 =$

F 13.469
G 15.359
H 19.463
J 20.84
K *None of the above*

2 $\frac{1}{2} + \frac{1}{3} =$

A $\frac{1}{6}$
B $\frac{2}{5}$
C $\frac{2}{3}$
D $\frac{5}{6}$
E *None of the above*

3 $\frac{7}{b} + \frac{8}{b} =$

F $\frac{15}{b}$
G $\frac{15}{2b}$
H $\frac{15}{b^2}$
J $15b$
K *None of the above*

4 $20 + (-71) + 59 =$

A -110
B -8
C 8
D 150
E *None of the above*

5 $3^3 + 5^3 =$

F 8^3
G 8^6
H 24
J 42
K *None of the above*

Subtraction

6 $\$106.29 - \$97.53 =$

A \$7.86
B \$8.76
C \$9.76
D \$10.86
E *None of the above*

7 $0.649 - 0.38 =$

F 0.269
G 0.279
H 0.369
J 0.611
K *None of the above*

8 $1\frac{1}{4} - \frac{3}{4} =$

A $\frac{1}{4}$
B $\frac{3}{4}$
C 1
D 2
E *None of the above*

9 $7.1 - 0.341 =$

F 3.69
G 3.71
H 4.301
J 6.759
K *None of the above*

10 $(-4) - 2 =$

A -6
B -2
C 2
D 6
E *None of the above*

Multiplication

11 $\begin{array}{r} 2.05 \\ \times\ 0.45 \\ \hline \end{array}$

F 0.9005
G 0.9225
H 0.9425
J 0.9905
K *None of the above*

12 $\frac{1}{8} \times 160 =$

A $\frac{1}{20}$
B 2
C 20
D 32
E *None of the above*

13 $\frac{3}{4} \times \frac{1}{2} =$

F $\frac{3}{8}$
G $\frac{2}{3}$
H $\frac{12}{4}$
J $1\frac{1}{2}$
K *None of the above*

14 $4a \times 3a =$

A $7a$
B $12a$
C $7a^2$
D $12a^2$
E *None of the above*

15 $-4 \times (-2) =$

F -8
G -6
H 6
J 8
K *None of the above*

Division

16 $44.03 \div 7 =$

A 6.40
B 6.39
C 6.29
D 6.20
E *None of the above*

17 $777 \div 6 =$

F $119\frac{1}{3}$
G $128\frac{1}{2}$
H $129\frac{1}{3}$
J $129\frac{1}{2}$
K *None of the above*

18 $\frac{2}{a} \div \frac{2}{a} =$

A 0
B 4
C $4a$
D $4a^2$
E *None of the above*

19 $\frac{1}{4} \div 4 =$

F $\frac{1}{16}$
G $\frac{1}{8}$
H 1
J 16
K *None of the above*

20 $2 \div 1\frac{1}{2} =$

A $\frac{3}{4}$
B $1\frac{1}{3}$
C $1\frac{1}{2}$
D 3
E *None of the above*

Addition

21 $0.111 + 0.589 + 0.9 =$

F 1.6
G 6.09
H 8.0
J 16.0
K *None of the above*

22 $18\frac{2}{5} + 5\frac{1}{2} + 12\frac{3}{10}$

A $35\frac{2}{5}$
B $36\frac{1}{10}$
C $36\frac{1}{5}$
D $36\frac{3}{10}$
E *None of the above*

23 $4^3 + 2^4 =$

F 6^7
G 20
H 72
J 80
K *None of the above*

24 $3x^2 + 4x^2 =$

A 7
B $7x$
C $7x^2$
D $7x^4$
E *None of the above*

25 $\frac{a}{3} + \frac{a}{4} =$

F $\frac{a^2}{7}$
G $\frac{2a}{7}$
H $\frac{7a}{12}$
J $\frac{a}{12}$
K *None of the above*

Subtraction

26 $\frac{7}{10} - \frac{7}{100} =$

A 0
B $\frac{49}{100}$
C $\frac{63}{100}$
D 1
E *None of the above*

27 $3^4 - 3^2 =$

F 9
G 18
H 72
J 81
K *None of the above*

28 $28 - (-13) =$

A -41
B -15
C 15
D 41
E *None of the above*

29 $\frac{x}{3} - \frac{x}{6} =$

F $\frac{x}{18}$
G $\frac{x}{9}$
H $\frac{x}{6}$
J $\frac{x}{3}$
K *None of the above*

30 $3x^2 - x^2 =$

A 3
B $2x$
C x^2
D $2x^2$
E *None of the above*

Multiplication

31 $2\frac{1}{2} \times \frac{1}{2} =$

F $\frac{1}{4}$
G $\frac{4}{5}$
H $1\frac{1}{4}$
J $3\frac{1}{2}$
K *None of the above*

32 $0.07 \times 0.48 =$

A 0.0336
B 0.286
C 0.336
D 3.26
E *None of the above*

33 $\frac{3}{a} \times \frac{2}{a^2} =$

F $\frac{3}{2a}$
G $\frac{6}{a^2}$
H $\frac{5}{a^3}$
J $\frac{6}{a^3}$
K *None of the above*

34 $-4y^3 \times 3y^2 =$

A $-12y^6$
B $-12y$
C $12y$
D $12y^6$
E *None of the above*

35 $\frac{10}{x} \times \frac{1}{x} =$

F $\frac{10}{x}$
G $\frac{1}{10}$
H 10
J $\frac{10}{x^2}$
K *None of the above*

Division

36 $\frac{9n}{3n} =$

A 3
B $3n$
C $6n$
D 27
E *None of the above*

37 $0.63\overline{)31.5}$

F 0.5
G 5.0
H 50.0
J 500.0
K *None of the above*

38 $(-2) \div (-2) =$

A -4
B -1
C 0
D 1
E *None of the above*

39 $\frac{x^3}{x^2} =$

F $\frac{1}{x}$
G 1
H x
J $2x$
K *None of the above*

40 $6n \div 2n =$

A 4
B 12
C $\frac{n}{3}$
D $3n$
E *None of the above*

APPENDIX B

Setting-Specific Procedures

Individual Group

Subjects in the individual and computer groups were administered the arithmetic subtest of the WRAT in the same room. After completing the WRAT, the subject in the computer group was taken to the adjacent room where the computer was situated. During the math tests, the subject in the individual group was provided a constant reminder of the elapsed time by a digital stop watch, which was placed immediately in front of him or her.

Computer Group

After completing the WRAT, the subject was given a brief explanation of how to interact with the computer, a Commodore 8032. The subject was told the computer would administer the remainder of the experiment, but that the experimenter would be available if there were difficulties.

A program was developed to administer the questionnaires and administer and score the math test for the computer group. Subjects

were presented with all questionnaires in a format in which questions were presented one at a time. For each questionnaire, the directions and the appropriate scale were always visible at the top of the screen. Subjects had to provide an answer that was within the range of the appropriate scale (e.g., between the numbers 1 and 7) and were given the opportunity to correct each answer before continuing to the next question. If subjects entered any information that was not in the range expected they were prompted with a message stating that their response was out of range and requested to reenter their response.

For the math tests, a countdown timer was displayed at the top of the screen. Questions were presented one at a time and, similar to the procedure for the questionnaires, subjects could only enter in-range responses. When time ran out, subjects were directed to complete the next set of questionnaires.

The program collected all the data and wrote this information to a disk file. It administered, graded, and timed the math tests, providing the subjects with a constant reminder of the time remaining. Finally, based on subject number, the program assigned subjects to the proper time order. All subjects with an even number in the tens column were given five minutes for the first test and ten minutes for the second. Those with an odd number in the tens column had ten minutes for the first test and five for the second. Apart from the format, the procedure for the computer group was identical to that of the individual group.

Classroom Group

The procedure for classroom subjects was essentially the same as that for the individual and computer group subjects, except that subjects in this group completed all the tasks in a group setting in a university classroom. Each set of questionnaires was completed by all subjects before continuing to the next set. During the math test, the time remaining was written on the board and updated every 30 seconds. Tests were marked by the experimenter and an assistant in the classroom.