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Cognitive/decisional Predictors Of Coping Propensity And Stress Arousal: Validation Of A Choice/control Schema

Mary C. Lees

COGNITIVE/DECISIONAL PREDICTORS OF COPING PROPENSITY AND STRESS AROUSAL: VALIDATION OF A CHOICE/CONTROL SCHEMA

by

Mary C. Lees

Department of Psychology

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Faculty of Graduate Studies
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ABSTRACT

Although stress investigators have intimated that decisional processes comprise important precursors to coping activity, there have been few attempts, within the stress domain, to conceptualize coping behaviour in the context of stress-relevant decisional models. In the present dissertation, an attempt was made to evaluate Neufeld's (1982) choice/control model. This model, which was derived from subjective expected utility theory, makes three interrelated hypotheses regarding the determinants of coping propensity and anticipatory stress arousal. Hypothesis One states that the propensity to engage in counterstress activity will be an inverse function of the ratio of the expected value of stress, given counterstress activity, to the expected value of stress, given no counterstress activity. Hypothesis Two states that anticipatory stress arousal primarily will be a function of the lowest of the latter numerator or denominator components. Hypothesis Three states that anticipatory stress arousal will increase, due to decisional uncertainty, as the value of the cost-of-coping ratio approaches one.

The model was evaluated in the context of four interrelated studies. Three studies involved the analysis of self-report judgments of stress and one study involved the analysis of cognitive, behavioural, and psychophysiological indicators of stress. Together, study results provided strong and stable support for Neufeld's (1982) choice/control model across different experimental contexts and different response modalities. Results also revealed three types of stressor situations in which model-relevant hypotheses were not consistently supported. These included (a) "challenging" situations and situations outside the threat domain; (b) situations characterized by the juxtaposition of incompatible response tendencies; and (c) situations characterized by "impact uncertainty". An examination of the conditions under which choice/control hypotheses were not supported suggested that future investigations should be concerned with: (a) the perceptual versus

mathematical distinction between the cost-of-coping ratio components; (b) the influence on choice behaviour of changes in stress expectancy judgments over time; and (c) the potentially different components of global stress expectancy judgments and their implications for the variable meaning of the latter. Even in the absence of such investigations, it is argued the model has strong heuristic value in its current, unmodified form.

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CHAPTER 1. INTRODUCTION

Throughout our lives, we continually are confronted with stressors that range from frequent minor, irritating "hassles" (e.g., see Kanner, Coyne, Schaefer, & Lazarus, 1981) to more traumatic, large-scale stressful life events (e.g., see Holmes & Rahe, 1967). Over the course of the past two decades, evidence relating the cumulative frequency of these stressful events to a variety of psychological and physical disorders has accumulated (Cohen & Edwards, 1989). In the psychiatric domain, researchers have noted that high frequencies of life events may play either a "formative" or "triggering" role in such disorders as depression (e.g., Paykel, 1978) and schizophrenic psychosis (e.g., Chung, Langeluddecke, & Tennant, 1986; Ventura, Nuechterlein, Lukoff, & Hardesty, 1989). In the medical domain, stress at least has been implicated in such disorders as arthritis (e.g., Genest, 1989) and coronary heart disease (e.g., Glass, 1977). Thus, it is apparent that stress, through still often unknown mechanisms, has serious implications for emotional and physical health. Accordingly, it has become of interest to investigate potential "stress resistance" behaviours, which collectively, fall under the rubric of "coping" (Lindop & Gibson, 1982).

Within the stress domain, various modes of coping behaviourally with stress previously have been identified (e.g., see Averill, 1973; Lazarus & Folkman, 1984; Miller, 1979; Pearlin, Menaghan, Lieberman, & Mullan, 1981; Pearlin & Schooler, 1978; Thompson, 1981). Although the terms used to refer to these identified types have varied, they generally have distinguished between coping which is "instrumental" and coping which is "emotion-related". "Stimulus-directed" coping is oriented toward the elimination or attenuation of original stressor cues. In general, it can refer to any of a host of instrumental activities designed to influence stressor occurrence, probability, and/or severity (e.g., see Pearlin et al., 1981; Pearlin & Schooler, 1978). "Response-" and "appraisal-directed" forms of coping, on the other hand, are directed toward altering the magnitude of the stress response and the perception of stressor cues, respectively (Pearlin et al., 1981; Pearlin & Schooler, 1978). In comparison to stimulus-directed coping, these forms suffer from the potential disadvantage of not being able to alter actual stressor characteristics.

Coping Strategies and Adaptational Outcomes

As a result of their associations with adaptational outcomes, investigations of the relative effectiveness of the aforementioned types of coping strategies have commanded considerable empirical attention. Although there have not been any clear-cut or consistent findings which would suggest that either stimulus-directed or response- and appraisal-directed strategies universally are preferable, each has been shown to have relative advantages and disadvantages, depending on the person, the situation, and the coping stage (e.g., see Lazarus & Folkman, 1984).

In stressful situations characterized by potential control, stimulus-directed coping strategies have been shown to offer such advantages as opportunities for effective action, ventilation of affect, and assimilation and resolution of trauma (e.g., see Roth & Cohen, 1986, p. 817). Under certain stressful circumstances, they also have been demonstrated to fare better than response- and appraisal-directed strategies in terms of positive, long-term adaptational outcomes (e.g., see Suls & Fletcher, 1985). However, stimulus-directed strategies also have been associated with an array of negative adaptational consequences. For example, engaging in instrumental behaviour has been shown to result in the onset of new and unforseen stressors which may not be predictable upon the initiation of action (Schonpflug, 1986). In addition, it has been shown to result in such emotional consequences as increased stress arousal and nonproductive worry (Roth & Cohen, 1986).

In contrast to stimulus-directed strategies, response- and appraisal-directed strategies have been shown to result in reductions in stress and anxiety, and in a sense of mastery over threat-related distressing emotions (Roth & Cohen, 1986). They also frequently have been demonstrated to be superior to stimulus-directed strategies in uncontrollable stressful situations (e.g., see Lazarus & Folkman, 1984) and in terms of positive, short-term adaptational outcomes (e.g., see Suls & Fletcher, 1985). However, the potential disadvantages of response- and appraisal-directed strategies also have been shown to be significant. In potentially controllable situations, response- and appraisal-directed strategies have been shown to interfere with the identification and initiation of appropriate action. In addition, they have been associated with states of "emotional numbness" and with a variety of disruptive avoidance behaviours (e.g., see Roth & Cohen, 1986).

Proposed Determinants of Coping Behaviour

As the aforementioned discussion suggests, stimulus-directed and response- and appraisal-directed forms of coping inevitably are linked to individual adjustment. Thus, there has been a longstanding interest in the determinants of these coping behaviours and in the implications of these determinants for adaptation. A review of the literature suggests that the hypothesized determinants of coping activity generally resemble those associated with perceptions of stress. Thus, previously investigated determinants include personality, situational characteristics, and/or some interaction between the two (e.g., see Fisher, 1986; Lazarus & Folkman, 1984). However, the majority of extant research studies clearly have conceptualized coping behaviour as being a function of dispositional personality traits (Lazarus & Folkman, 1984). The eminence of the trait approach may be traced to the early psychoanalytic ego psychology models (e.g., see Haan, 1969; Menninger, 1963; Valliant, 1977) which once dominated coping theory and measurement (Lazarus & Folkman, 1984). However, in spite of the overwhelming popularity of the trait approach, and in spite of the plethora of research it has engendered, it generally has been subject to rather mixed reviews due to the nature of its equivocal results.

In the following section, a brief review of the trait approach and its contributions to the literature will be presented. Discussion also will be devoted to clarifying why this perspective has answered only part of the approach/avoidance question. Following this discussion, it will be argued that the determinants of approach/avoidance behaviour may best be understood from a decision theoretical perspective. The foundations then will be laid for the presentation of a choice/control model purporting to capture decisional predictors of coping propensity.

The Dispositional or Trait Approach to Coping Behaviour

Within the dispositional or trait approach to coping behaviour, the tradition has been to classify individuals along some approach-avoidance dimension (e.g., internal versus external locus of control; Rotter, 1966) and to make predictions about how psychometrically indexed "types" will behave in certain types of stressful encounters. Two underlying assumptions of this approach to coping behaviour are that individual differences in approach-avoidance tendencies will distinguish individuals' coping behaviours in certain stressful situations, and that differences in approach-avoidance tendencies will show some consistency over time. An additional assumption is that differences in approach-avoidance tendencies will have different implications for adaptational outcomes.

Although each of the aforementioned notions has received at least some empirical support within the coping literature (e.g, see Averill & Rosenn, 1972, for evidence of individual differences in approach-avoidance tendencies; Cohen & Roth, 1984; Gorzynski et al., 1980; Manuel & Roth, 1984; for evidence of consistency in coping styles across time; and Strickland, 1978, for evidence of certain adaptational advantages of internal versus external locus of control) the general consensus is that most extant trait measures are poor predictors of specific coping behaviours (e.g., see Cohen & Edwards, 1989; Laux & Vossel, 1982; Lazarus & Folkman, 1984). According to Laux & Vossel (1982), the most problematic issue for the trait approach is that of behavioural consistency. Within the coping literature, behaviour has not been demonstrated to show the consistency that the assumptions of the trait approach would require. Although no trait theorist would advocate absolute consistency in coping behaviour across stressful situations or time, they would, nonetheless, advocate what Magnusson (1976) has referred to as "relative consistency" over time. Relative consistency refers to a consistent rank ordering of individuals on a given trait across multiple occasions. Mathematically, such consistency is assessed via correlational analyses which make similar assumptions about rank order properties. Although impressive degrees of relative consistency have been shown on trait measures across situations that are characteristically similar, research over the years has revealed little empirical evidence of consistency across dissimilar situations (Laux & Vossel, 1982). This raises particular problems for the prediction of behaviour within the stress and coping domain, for here, situations empirically have been classified along multiple dimensions and have been shown to elicit correspondingly different behavioural responses (e.g., see Ekehammar & Magnusson, 1973; Magnusson, 1971; Magnusson & Ekehammar, 1973, 1978). Indeed, the most prominent findings within the stress domain suggest considerable variability in coping behaviour. In addition, this variability has been demonstrated both within and across individuals, and both within and across situations (e.g., see Lazarus & Folkman, 1984; Roth & Cohen, 1986). Thus, trait measures of approach/avoidance have been able to answer only part of the question about the determinants of coping behaviour. Specifically, they have only been effective in similar types of stressful situations eliciting situationally-relevant personality traits (e.g., see Lazarus & Folkman, 1984).

Problems With and Alternatives to Traditional Trait Approaches

Although there may be numerous reasons for the frequent failure of the trait approach to predict actual coping behaviour, there are two which appear to the primary determinants of this continuing state of affairs. First, the majority of extant research studies have been plagued by statistical and conceptual difficulties which potentially have rendered them insensitive to real findings (e.g., see Cohen & Edwards, 1989). As Lazarus and Folkman (1984) have noted, the questionable measurement of coping traits has been particularly problematic in this regard. For example, existing trait measures rarely reflect the multidimensional nature of the coping process or of frequently investigated coping traits. Rotter's (1966) Locus of Control Scale, which has been used widely to predict coping behaviour, frequently has been criticized in this regard (e.g., see Fisher, 1986). Furthermore, trait measures typically are worded so as to elicit only very general judgments about what a person usually does in a stressful encounter. However, rarely are these instruments used repeatedly in different situations so that evidence about cross-situational consistency may be acquired (Lazarus & Folkman, 1984). Thus, as Lazarus and Folkman (1984) have noted, these measures may only be trait measures in the sense that they are defined so by investigators of stress. One is reminded here of Allen & Potkay's (1981) discussion regarding the frequently arbitrary distinction between the concepts of "state" and "trait".

In addition, trait approaches have used measurement models and methods of analysis which are inappropriate for answering certain types of behavioural questions (Magnusson, 1976). For example, they clearly are not amenable to explaining cross-situational variability, or to predicting situation-specific behaviours (e.g., see Ajzen, 1991). The difficulty here is that within the trait approach, situations are treated as sources of error (Magnusson, 1976). Thus, it is assumed that behaviour primarily is a property of the person, and that situational variability is of little importance (Folkman, Lazarus, Dunkel-Schetter, DeLongis, & Gruen, 1986). However, newer approaches to the prediction of coping behaviour have suggested the importance of both traits and situations. This has been reflected in methodological strategies that have attempted to accommodate the phenomenon of cross-situational variability. For example, a number of theorists have developed psychometric instruments designed to assess "narrow" or "situation-specific" traits (Laux & Vossel, 1982). Spielberger's (1980) "Test Attitude Inventory", which assesses "examination anxiety" clearly falls within the latter classification. Scores on "specific traits" typically are used to predict individuals' behaviours in relatively specific, versus general, situations. In comparisons of "general" and "situation-specific" inventories, the latter frequently have been shown to be superior in terms of predicting individuals' behaviours (e.g., see Laux, Glanzmann, & Schaffner, 1982; Mellstrom, Zuckerman, & Cicala, 1978). However, in spite of the ability of the latter approach to accommodate the influence of the person-situation interaction, it is nonetheless, still limited in that it cannot effectively accommodate <u>all</u> situations that could be encountered. Thus, while certain increments in prediction effectively may be achieved by the latter approach, it also exhibits clear predictive limits. Thus, a more universal approach, which potentially would be relevant across all situations, would certainly appear to be in order.

<u>The Purpose of the Present Dissertation</u>

The above does not suggest that trait approaches will not make contributions to the study of coping behaviour. As Azjen (1991) has noted, the dispositional approach was intended to demonstrate that traits <u>are</u> implicated in human behaviour. However, it is possible that evidence of traits will only be discernible by looking at valid aggregates of relevant behaviour. In specific situations, it is likely that the influence of traits will be attenuated by more immediate, situation-specific factors (Ajzen, 1991). Yet, knowledge of the determinants of situation-specific coping is necessary to a full understanding of stress. It is, after all, the accumulation of such situations that ultimately impacts psychological and physical adjustment. Furthermore, the link between proposed determinants and physiological and emotional stress arousal deserves more scrutiny at a molecular level. This is especially important, given that chronic aberrations in stress arousal levels have been shown to have numerous implications for adjustment (e.g., Selye, 1976).

It has been argued that behaviour is characterized by lawful and predictable variation, rather than by absolute or relative stability. Thus, rather than being "consistent", Endler and Magnusson (1976) argue instead, that behaviour exhibits a quality they refer to as "coherence". According to Endler and Magnusson (1976), coherent behaviour stems from the operation of certain cognitive mediational processes. These cognitive processes, which are assumed to be absolutely consistent, ultimately influence the selection and interpretation of situational information (Laux & Vossel, 1982).

In the present dissertation, it will be contended that there exists a consistent set of cognitive-appraisal variables that lawfully predict inclinations to cope. The values of these cognitive-appraisal variables specifically will be assumed to be influenced by both personality and situational variables. Although these cognitive-appraisal variables will be assumed to be cross-situationally consistent, the behaviours they potentially motivate will not. Differences in behaviour, across potentially stressful situations, will be assumed to be a function of differences in constituent variable values. The cognitive-appraisal variables selected for investigation in this dissertation will be both decisional and stress-relevant in nature. This selection is justified by the observation that in each and every stressful encounter, to cope or not to cope ultimately is a decision. Accordingly, the determinants of stress-relevant approach/avoidance behaviours will be examined from a decision theoretical perspective. Specifically, they will be examined by placing them in the context of a choice/control model (Neufeld, 1982) derived from subjective expected utility (SEU) theory (Edwards, 1954; Feather, 1982). The specific purpose of the dissertation will be to attempt to evaluate a choice/control model (Neufeld, 1982) which encompasses the aforementioned cognitive-decisional factors. Of crucial importance will be the influence of certain stress expectancy values and the manner in which they operate together. Predictions will be made in regard to the relationship of these stress expectancy values to coping propensity and anticipatory stress arousal.

Prior to embarking on a discussion of this model, an overview of the decision theoretical approach will be presented. Specific attention will be given to the components of typical risky decision problems and to the manner in which formal decision theory hypothesizes they are solved. This discussion will be followed by an evaluation of the decision theoretical approach which focuses on its relative limitations and relative strengths. Following, then, will be a presentation of the choice/control model (Neufeld, 1982) and a description of the aims of the subsequent studies.

Overview of The Decision Theoretical Approach

Formal decision theoretical models may be said to fall under the larger rubric of generalized expectancy-value models. Although the labels accorded these models tend to vary from discipline to discipline, their underlying, integrating characteristics remain the same. In general, expectancy-value models attempt to relate the actions of individuals to the perceived attractiveness of expected future consequences. That is, the actions of an individual are assumed to bear some relation to the expectations that the individual holds, and to the subjective value of the consequences that might occur (Feather, 1982).

Within formal decision theory, expectancy value models traditionally have been referred to as "expected utility (EU) models". More recently, with the incorporation of subjective probability values, they have come to be referred to as "subjective expected utility (SEU) models" (e.g., see Edwards, 1954). Since the time of World War II, researchers attempting to investigate choice behaviour have relied almost exclusively on EU approaches (Schoemaker, 1982). Thus, unlike other areas of psychology, the study of decision making has been rooted largely in economics and statistics (Maule, 1985). Although alternative approaches to the study of decision making recently have emerged (e.g., see Maule, 1985, for a discussion of the contributions of cognitive psychology to the understanding of individual decision making), none has enjoyed the empirical history or longevity of the decision theoretical approach.

A review of the literature suggests at least two potential reasons for the longstanding attractiveness of the EU approach. First, expected utility maximization formally was proven to be a rational decision criterion via the axioms of Von Neumann and Morgenstern (1947). These axioms and their proof later were reformulated by Marschak (1950) and forwarded as definitions of rational behaviour under risk (Schoemaker, 1982). In addition, EU theory tends to be conceptually simplistic, in addition to being mathematically tractable (Schoemaker, 1982). Proofs surrounding its conditions of tenability, however, although tractable, may be considerably more complex (Fishburn & LaValle, 1992). From its "optimizing" perspective, it predicts that the selection of the highest paying future will stem from constructions and comparisons of probabilities and utilities.

The Structure of, and Hypothesized Solution To, Formal Risky Decision Problems. Within the context of decision theory, problems generally have been classified as falling under one of two possible types. In choice situations involving preferences, but not probabilities, problems typically have been referred to as "riskless" decisions (Abelson & Levi, 1985). Examples of riskless decisions include selecting meals from a menu, or selecting colours of paint for one's home. Clearly, these are decisions which involve obvious preferences for alternatives, but little in the way of "stakes" or relative risks. In contrast to riskless decisions, "risky" decisions formally have been defined as involving both preferences and probabilities. Probabilities are invoked because one rarely can anticipate all the consequences of choosing a given option. The types of risky decisions most frequently examined in formal decision theory are lotteries, insurance options, and gambles (Abelson & Levi, 1985). However, the decision to cope in the face of a stressful encounter clearly also falls within this classification.

From the perspective of decision theory, the characteristics of a risky decision problem may be broken down into three, interrelated components. These include the acts or options available, the outcomes or consequences associated with these acts, and the conditional probabilities relating outcomes to acts (Tversky & Kahneman, 1981). Within EU theory, it is assumed that an individual facing such a problem chooses a course of action in a "rational" way. In general, it is easiest to conceive of this rational action as being comprised of three separable stages. In the first stage, each outcome is evaluated in a systematic manner according to its utility and likelihood of occurrence. The overall attractiveness of an option then is calculated by summing the products of the utilities and probabilities associated with each of its potential outcomes. Finally, the "best" or most rational course of action is selected by determining the option with the highest expected utility. Evaluation of alternatives is assumed to be holistic in nature, with the attractiveness of each alternative being assessed independently of the others (Schoemaker, 1982, p. 530).

Limitations of Expected Utility Models

As the aforementioned example suggests, EU approaches hypothesize that some rather complicated computational and combinatorial processes form the basis of "rational" decision making. Unfortunately, strong and convergent empirical evidence suggests that these formal decisional notions may not represent the realities of human choice behaviour (Bonoma, 1982).

From the optimizing perspective of formal EU theory, decision making is seen as being associated with certain characteristics. These include holistic and exhaustive option searches, in addition to highly coherent and consistent decisional outcomes that tend to be reflective of formal EU mathematical properties. The criteria of holistic and exhaustive searches implies that when faced with risky decision problems, judges completely and accurately structure all problem components. From the perspective of the judge, this implies a thorough and inclusive cognitive search of all relevant possible options and consequences. Unfortunately, however, there is empirical evidence to suggest that judges have difficulty achieving complete problem representations (e.g., see Fischhoff, Goitein, & Shapira, 1982). According to Fischhoff et al. (1982), this often results in decision-jeopardizing omissions which reduce the "optimality" of decisional processes. Furthermore, the literature on decisional strategies (e.g., see Janis & Mann, 1977) suggests that rather than engaging in "optimizing", judges often "satisfice", or choose the first appropriate option to come along. Thus, the constraints of time, and various other factors, such as the limits of the human cognitive system, often preclude the criterion of an "exhaustive" expected utility search.

The notion of the coherence and consistency of formal decisional processes emanates from the axioms underlying EU theory itself (see Schoemaker, 1982, for descriptions of these axioms). Although discussion of these axioms is well beyond the scope of the present paper, their general implications are of considerable importance. When EU axioms are met, the outcomes of formal decision theoretical processes stand in consistent and logical relation to one another. However, when violations occur, outcomes no longer remain predictable, and EU outcomes become incoherent and inconsistent. Unfortunately, violations of the most basic EU axioms have been shown in both laboratory (e.g., Coombs, 1975; Kahneman & Tversky, 1979; Tversky, 1969) and real-life settings (e.g., Kunreuther, 1976). In addition, the literature on risky decisions has suggested that choosing among options is a highly contextually-based form of information processing (e.g., see Payne, 1982, 1985). Thus, consistency and coherence, the hallmarks of EU rationality (Tversky & Kahneman, 1981), rarely are apparent within this research domain. This brings into question then, the utilization of formal EU theories as descriptive models of decision behaviour.

Defense of the Expected Utility Approach

According to Simon (1976), the greatest difficulty with formal EU theory is that it imposes "inhuman" information processing demands. This is certainly a tenable hypothesis, given the body of empirical evidence supportive of man's limited short-term memory capacity (e.g., Miller, 1956). Faced with these limitations, decision makers appear to process risky problems so as to achieve comfortable levels of cognitive simplification. In addition, they appear to exhibit shifts in attention toward certain problem aspects, in association with consequential shifts in preference (Simon, 1976). These information processing biases result in incomplete problem representations, and in inaccurate assessments of relevant probabilities and values. Thus, they also result in distorted values and theoretically suboptimal decisions which run counter to EU theory.

However, in spite of the unarguable weaknesses of EU theory, it continues to hold a considerable amount of appeal (e.g., see Bonoma, 1982; Fischhoff et al., 1982). It increasingly is being applied across a wide variety of disciplines to predict a wide array of choice behaviours (Bonoma, 1982; Fischhoff et al., 1982). Although it is tempting to suggest that its continued application is the result of a denial of its numerous weaknesses (Bonoma, 1982), it is probably more accurate to state that its continued application stems from the basic truth of certain of its tenets. For example, the EU assumption that individuals generally try to "maximize" their behaviour has seldom come into critical dispute. Just what people attempt to maximize, and how specifically, they do it, has been the issue more open to question (Fischhoff et al., 1982). Furthermore, the fact that decision makers do not scale their choice alternatives according to the rules of EU theory, does not necessarily mean that they do not employ some "subjective probability times worth" model in making their choices from among alternatives (Bonoma, 1982). For example, in their search for the highest paying future, it appears that decision makers do effectively combine certain probability and utility considerations (Janis & Mann, 1977). Relatively recently, for example, SEU has been used successfully to predict certain exercise (e.g., see Kendzierski & Lamastro, 1988) and sexual (e.g., see Gilbert, Bauman, & Udry, 1986) behaviours.

Furthermore, the methodology of formal EU theory also has come into recent dispute by certain researchers of choice behaviour. Bonoma (1982), for example, has suggested that it is simply too premature to attempt precise psychometric measurement of EU dimensions (e.g., individual indifference curves, utility scaling, lottery bets, etc.) According to Bonoma (1982), operational difficulties have presented interpretive problems for the extant decision theoretical literature. Thus, it is unclear whether negative findings actually have disconfirmed EU concepts themselves, or simply the measurement methods employed. Furthermore, Bonoma (1982) himself has attempted to answer a crucial EU question which he claims has only received indirect empirical attention. This is the question surrounding individuals' abilities to think in probabilistic and worth terms, and to use these factors to maximize SEU's (p. 52). Rather than attempting to measure subjects' probability and utility scales from data provided by the outcomes of decisional choices, Bonoma (1982), instead, has provided subjects with this information, and asked them to "role-play" as decision makers. Results of his studies suggest that when using this methodology, SEU models easily account for decisional behaviour. Thus, when provided with appropriate data, subjects appear capable of reaching decisions compatible with SEU maximization principles.

In addition, the ecological validity of many formal decision theory problems may call some of the extant findings into question. Typically, formal decision problems comprise rather complicated lotteries and gambles which require a considerable amount of mathematical dexterity. There is evidence, however, that in more familiar and applied situations, preferences for decision alternatives correspond to SEU's. Two empirical studies briefly will be described in support of this latter point.

In a study by Holmstrom and Beach (1973), subjects were asked to rate their preferences for eight psychology-related occupations on a 100-point rating scale. A rating of 100 indicated the greatest degree of preference for an occupation, while a rating of zero was indicative of the least. In addition, utility estimates were obtained for each of 18 possible outcomes associated with each of the eight occupations. Here, subjects simply were required to rank order the 18 outcomes, and assign them a value on a 100-point scale. A rating of 100 was assigned to the "best" of the 18 outcomes, and a rating of zero was assigned to the "worst". The remaining 16 outcomes each were assigned a numerical value anywhere within the remaining range. Finally, subjects were asked to rate the probability of each outcome, given the selection of a given career alternative. SEU's then were calculated for each of the eight occupations using rated probabilities and utilities. Results of this study indicated that 77% of subjects had significant ($p < .05$) and positive SEU-preference correlations. The median correlation, among this group of subjects, was approximately .83. Using similar methodology and concentration in six academic areas as the possible decision alternatives, Muchinsky and Fitch (1975) generated 11 out of 15 significant, positive SEU-preference correlations, with a median correlation of .81.

According to Bonoma (1982), it is highly likely that subjects make maximization decisions similar to those outlined above when operating in the real world. Rather than being based on mathematically precise decisional criteria, however, these decisions are more likely to be made on the basis of "psychometrically improper" scales resulting from the operation of numerous cognitive constraints. As Bonoma (1982) has suggested, however, these constraints do not necessarily negate the utility of formal decision theories. Rather, they simply suggest that extant formal theoretical formulations may not represent entirely veridical descriptive models. Certain decisional notions encompassed by formal decision theories, however, still appear to hold a considerable amount of merit. For example, as has been demonstrated, the notion of subjective expected utilities and the drive to, in some manner, optimize decisional outcomes, still appears to be relevant to decisional processes.

The Relevance of Decisional Models to the Study of Coping Behaviour

In the study of coping behaviour, decisional models seem intuitively more useful than models which do not use the sums of products and values. This is because clearly, coping decisions depend, in one way or another, on the values and probabilities of certain perceived outcomes (e.g., see Abelson & Levi, 1985). Furthermore, prominent formulations of the precursors to coping behaviour have been phrased in decision theoretical terms. For example, the entire process of secondary appraisal (see Lazarus & Folkman, 1984), which is devoted to the selection of coping options, is most definitely, a decisional process. Finally, the notion of coping behaviour being amenable to cost-benefit analysis previously has been alluded to by investigators of stress. Fisher (1986), for example, has noted that "the cost of no action must be weighed against the cost of action" (p. 12). Similarly, Schonpflug (1986) has advocated that behaviour economics be adopted as an alternative approach to cognitive stress theory. To date, however, there have been no attempts to examine the determinants of coping activity within a purely decisional framework.

If it is to be assumed that tendencies to engage in controlling activity partially are dependent on cognitive-decisional processes, it becomes necessary better to understand some of the cognitive-decisional appraisals that act specifically as precursors to coping behaviour. The following sections will examine three interrelated aspects of stress-relevant probabilistic behaviour. These include: (a) predictive assessments relevant to general stress expectancy formulations; (b) decisional factors potentially influencing the exercise of control options; and (c) factors influencing the content and availability of predictive judgments.

Predictive Assessments Relevant to General Stress Expectancy Formulations

In the face of a stressful situation in which a number of stimulus-directed coping options are available, one of the first tasks of an individual, at least from a decision theoretical perspective, is to assess the degree of stress associated with his or her options. In order better to elucidate some of the predictive assessments relevant to these general stress expectancy formulations, let us first map out a potentially stressful scenario that is representative of the type in which we are interested.

Assume that an individual is vacationing in the mountains with a valued friend who tends to drive too fast and take big risks. Assume further, that in the face of this potentially stressful situation, this individual perceives three possible stimulus-directed coping options. These include: (a) volunteering to take over the driving; (b) volunteering to take an alternative form of transportation; and (c) insisting on being let out of the car. What are some of the predictive assessments that potentially will be relevant to determining the stress-expectancy levels of these options?

According to Neufeld (1982), one of the first assessments that this individual must make is whether entry into each of these three control situations is optional. Because it already has been stated that each of the options is available, it will be assumed that option entry is controllable. Given that option entry is controllable, Neufeld (1982) notes that a number of additional decisions must be made regarding each available option. For example, for every option outlined, there are a number of specific situational aspects that must be taken into account. Further, for each of these situational aspects, there are at least three subjective estimates that must be made in the process of assessing stress expectancy. These include: (a) the probability of the situational aspect occurring; (b) the probability of stress, given the situational aspect's occurrence; and (c) the degree of stress associated with the situational aspect itself.

Taking the first option outlined above as an example (i.e., volunteering to take over the driving), the individual involved in this scenario may determine that one aspect of this option is the possibility of insulting his/her most valued friend. Thus, as part of the assessment of the overall stressfulness of the option, he/she would have to assess: (a) the probability of the friend being insulted; (b) the probability of stress, given that the friend was insulted; and (c) the degree of stress associated with insulting the friend. A similar process would occur in relation to other aspects of this option, as well as in relation to the other two options' aspects. If the totality of such assessments suggested that the driving option was too undesirable, it might be avoided in favour of a different alternative.

In the language of mathematical expectancy theory, the aforementioned process of aspect assessment may be described by the following equation:

E(Stress)¦Situational Aspect = P(Situational Aspect) P(Stress¦Situational Aspect)(Stress Impact) (Neufeld, 1982, p. 242-243).

Certain relevant characteristics of this mathematical representation should be noted. First, in focusing exclusively on the "expectancy" component of anticipated stress, it omits consideration of that portion of anticipatory stress associated with the assessment process itself (Neufeld, 1982). However, the cognitive effort associated with these assessments also may result in additional increments in stress arousal. Second, as has been demonstrated in previous discussions, this mathematical formulation is undoubtedly an imperfect representation of the stress-expectancy assessment process. Despite certain questions surrounding the structural validity of the aforementioned stress-expectancy formulation, however, it still permits a useful estimation of the potential components of control-relevant stress-expectancy judgments (Neufeld, 1982). It tells us little, however, about the potential processes that ultimately determine the decision to exercise control. In order to better understand these, we must turn to a description of the types of hypothesized cost/benefit analyses that form the foundation of the decision theoretical perspective.

Decisional Factors Influencing the Exercising of Control Options: Expected Utility Considerations

In order more clearly to elucidate the complexity of the decision theoretical processes underlying control behaviour, an example will be borrowed from Neufeld and Paterson (1989, pp. 58-62). The example focuses specifically on the types of cost/benefit considerations that are hypothesized to characterize formal control decisions.

Let us assume that an individual is facing a potential stressor and that he/she has two possible choices. These include: (a) engaging in available counterharm activity; and (b) not engaging in available counterharm activity. In the language of the formal decision theoretical approach, these are the acts or options among which the decision maker must choose. Let us further assume that two possible outcomes are associated with each of the aforementioned options. These include: (a) experiencing relative safety; and (b) experiencing the absence of relative safety. Conditional probabilities of these outcomes given the exercise of control options also are assumed in the present scenario.

According to the description of formal decision processes outlined earlier (i.e., see "The Structure of, and Hypothesized Solution to, Formal Risky Decision Problems"), the first step in solving this decision problem is to assess each option outcome (i.e., relative safety, absence of relative safety) according to its utility and likelihood of occurrence. Because likelihood estimation is fairly self-explanatory in nature, only the assessment of utility will be explained.

Outlined in Figure 1-1 is a matrix representation of the typical utility considerations surrounding the exercise of available control. The columns represent potential outcomes emanating from abstinence from available control, while the rows represent the potential outcomes surrounding the decision to exercise control or not. The cells outline the net utilities, or net negative costs, associated with each relevant row/column combination. It is assumed in this matrix that individuals facing the present decision problem are ignorant of the column outcomes that actually would be in effect.

Turning first to the upper right hand cell, we can see that an individual can choose to engage in counterstress activity in a situation where the outcome will be potential danger in the absence of exertion of control. In terms of cost/benefit indices, or net utility considerations, this choice will lead to the utility of relative safety at the cost of exerting control. According to the upper left hand cell, the individual also can choose to exert control in a situation where the outcome will be relative safety in the absence of such control. Here, the net utility will be the same as in the upper right hand cell, however, it will be achieved at the cost of exerting unnecessary control. The lower left hand cell suggests that an individual can choose not to exert control and gain the utility of relative safety without the cost of implementing control. The lower right hand cell suggests that he/she can avoid controlling effort, but at the cost of relative safety.

The contents of the cell matrices are useful in delineating the utility considerations surrounding the exercise of available control. As was suggested in the aforementioned description of risky decision problems, however, the overall attractiveness of an option also must be assessed. This is accomplished by summing the products of the utilities and probabilities associated with each of its potential outcomes. The sums of these combinations of probabilities and utilities are known as "expected utility" estimates.

COURSE OF ACTION		OUTCOME, GIVEN ABSTINENCE FROM AVAILABLE CONTROL	
		RELATIVE SAFETY	ABSENCE OF RELATIVE SAFETY
	EXERCISE AVAILABLE CONTROL	Utility of relative safety, but the cost of implementing control	Utility of relative safety, but the cost of implementing control
	ABSTAIN FROM CONTROL	Utility of relative safety, and no cost of implementing control	Absence of relative safety, but no cost of implementing control

Figure 1-1. Utility considerations surrounding the exercise of available control.

Referring back to Figure 1-1, we can see that the expected utility of exercising available control will be equal to:

P(relative safety given the exercise of available control) x (net utility of relative safety given the exercise of available control) + P(absence of relative safety given the exercise of available control) x (net utility of absence of relative safety given the exercise of available control)

Here, the net utility of relative safety given the exercise of available control is equal to [(utility of relative safety) - (cost of implementing control)] (e.g., see the upper left hand cell of Figure 1-1), and the net utility of the absence of relative safety given the exercise of available control is equal to [(utility of relative safety) - (cost of implementing control)], (e.g., see the upper right hand cell of Figure 1-1).

Similarly, the expected utility of abstaining from available control will be equal to:

P(relative safety given abstinence from a ilable control) x (net utility of relative safety give abstinence from available control) + P(absence of relative safety given abstinence from available control) (net utility of absence of relative safety given abstinence from available control)

The net utilities for this equation are outlined in the lower left and right hand cells of the matrix in Figure 1-1.

Once these probability and utility judgments have been constructed and combined, the final step in the decision process is to select the course of action having the highest expected utility. As Neufeld and Paterson (1989) have suggested, this essentially amounts to comparing the cost of implementing control, over and against the contingent probability of relative safety, given abstinence from control. In other words, it amounts to combining subjective expected utility and maximization principles in order to arrive at a final decision.

From an understanding of the potential components entering into stress-relevant judgments, a better understanding may be achieved of the factors potentially underlying individual differences and cross-situational variability in coping behaviour. In general, it may be stated that differences in the magnitudes of decisional components will engender different decisions regarding counterstress activity. However, while componential magnitudes may change, the selection of components while componential magnitudes may change, the selection of components motivating coping behaviours presumably will remain the same. The following section will examine some of the factors that have been hypothesized to influence the magnitudes of decisional components. Specific emphasis will be placed on the availability and content of predictive judgments, as these have received the most theoretical and empirical attention (e.g., see Hogarth, 1987, for a complete review of factors influencing judgment and choice).

Factors Influencing the Availability and Content of Predictive Judgments

The "availability" of predictive judgments essentially refers to the extent to which decisional components are accessible and usable. Thus, availability has implications for one's ability to formulate stress-relevant judgments and to engage in subsequent synthesizing procedures (Neufeld, 1982). Reduced availability typically will jeopardize decisional processes to the extent that it results in inadequate or incomplete stress-relevant information. According to the stress literature, availability may be compromised by factors which are both external and internal in nature.

In terms of external factors, availability may be reduced by such situational characteristics as novelty, ambiguity, and unfamiliarity. In the latter types of situations, memorial traces of contingency-relevant parameters are not clearly at the decision-maker's disposal. In addition, reduced availability also may result from internal factors, such as reduced information processing capabilities. The primary difficulties here are related to one's ability to formulate stress-relevant judgments and to engage in appropriate synthesizing procedures. At least two potential sources of reduced information processing capacity have been identified in the literature on stress. These include various forms of psychopathology, such as depression (e.g., Byrne, 1976) and schizophrenia (e.g., Nicholson & Neufeld, 1989), and fluctuations in stress arousal itself (e.g., see Cohen, Evans, Stokols, & Krantz, 1986). Such processing deficits may be especially detrimental when the decision-maker has numerous options at his/her disposal. In situations such as these, it has been demonstrated that accessing and combining stress-relevant judgments can be particularly taxing and cognitively challenging (e.g., see Morrison, Neufeld, & Lefebvre, 1988).

In addition to availability, the content of predictive judgments also may influence the nature of stress-relevant appraisals. The content of predictive judgments may be influenced by both personality and situational factors, in addition to certain biases in the processing of information. For example, if a person is biased toward expecting negative outcomes, the values of stress-relevant decisional components may be inflated. Evidence of such a cognitive bias has emerged in the domain of psychopathology, where depressives have shown higher recalls for negative outcomes (e.g., Buchwald, 1977; De Monbreun & Craighead, 1977; Kuiper, 1978; Nelson & Craighead, 1977). Variations in situational parameters also may act to change the nature of stress-relevant appraisals. For example, choices in isomorphic problems have been shown to vary quite substantially as a function of task complexity, information display, and response mode (e.g., see Payne, 1982, 1985). These variations, in turn, have been attributed to certain perceptual biases which influence the contents of predictive judgments. Of particular importance to the present dissertation is the biased construction of subjective probability judgments. These biases appear to be related to certain information processing strategies that neglect appropriate use of statistical information. Estes (1976), for example, has demonstrated the tendency of judges to formulate frequency-based versus statistically-based subjective probabilities. Similarly, Kahneman & Tversky (1973) have noted the operation of certain "predictive heuristics" in which dimensions of content replace appropriate statistical information.

Each of the aforementioned factors may act to influence the nature or magnitude of stress-relevant decisional components. Thus, each likely also underlies observed variations in coping behaviour across individuals and across stressful situations. As was stated previously, however, although the aforementioned factors may act to change the magnitudes of decisional components, the underlying cognitive-decisional processes relating these components presumably will remain the same. In the following section, a proposed description of these consistent decisional processes will be presented in the context of Neufeld's (1982) choice/control model. This will be followed by an overview of questionnaire and laboratory studies designed to evaluate the tenability of the outlined schema.

Neufeld's Choice/Control Model

Originally, Neufeld's (1982) choice/control model devolved from an analysis of individual differences in coping propensity and an analysis of decisional processes instigated by threat. Thus, the model was designed to accommodate findings relevant to decisional processes and findings regarding individual differences in coping propensity. Despite the cogency of the model and the number of testable implications it potentially may contain, it has not been corroborated, and thus, still may be considered only tentative in its both its form and testable implications. Accordingly, it will be the purpose of the present dissertation to evaluate the tenets of the choice/control model. The implications of a valid model will be discussed in the context of a later section following presentation of the schema itself.

Qualifications to the Model. Prior tc embarking on a description of the model, a number of qualifying comments are in order. These pertain to the definition of "counterstress activity", the nature of the activities encompassed by the model, and the particular stress-transaction phase that will be of interest.

First, within the choice/contrᵛol model "counterstress activity" will refer to those threat-related activities which are directed toward the likelihood and/or impact of impending events (Neufeld, 1982). Thus, the model specifically will be concerned with "stimulus-directed" or "problem-focused" modes of coping, versus activities which are "nonthreat-related" (e.g., see Gal & Lazarus, 1975). Second, it should be noted that both covert and overt activities fall under the rubric of counterstress activity. Thus, choosing among options, or activities related to decisional control (e.g., see Averill, 1973), may be conceived of as an important form of counterstress activity. Third, because it is the aim of the choice/control model to focus on the anticipatory stress-transaction stage, "propensity toward counterstress activity" will be defined as an "inclination" or "preparedness" to influence impending event likelihood and/or impact (Neufeld, 1982). The "intensity" of counterstress activity will be assumed to be measurable via response latency, "effusiveness", and "perseverance" (Neufeld, 1982).

Description of the Model. Referring now to Figure 1-2, it can be seen that the choice/control model is comprised of three, interrelated dimensions. For purposes of discussion, these dimensions will be labelled the "Cost Ratio" (CR; depicted along the horizontal axis), "Coping Propensity" (CP; depicted along the vertical axis), and "Stress Arousal" (SA; depicted in the third dimension) dimensions, respectively.

According to the choice/control model, the propensity to engage in counterstress activity (CP) will be a function of two stress expectancy values. These include the expected value of stress, given engagement in counterstress activity [i.e., E(Stress)|Counterstress Activity] and the expected value of stress, given no engagement in counterstress activity [i.e., E(Stress)|No Counterstress Activity]. The model firstly, predicts that the propensity to engage in counterstress activity will be a function of the ratio of these two stress expectancy values. Specifically, it predicts that coping propensity will vary inversely with the size of the stress-expectancy ratio. In Figure 1-2, this relationship is depicted by the thick black lines in the midst of each three-dimensional segment.

It should be noted that although the construct of "expected stress" is adapted from subjective expected utility approaches (e.g.,

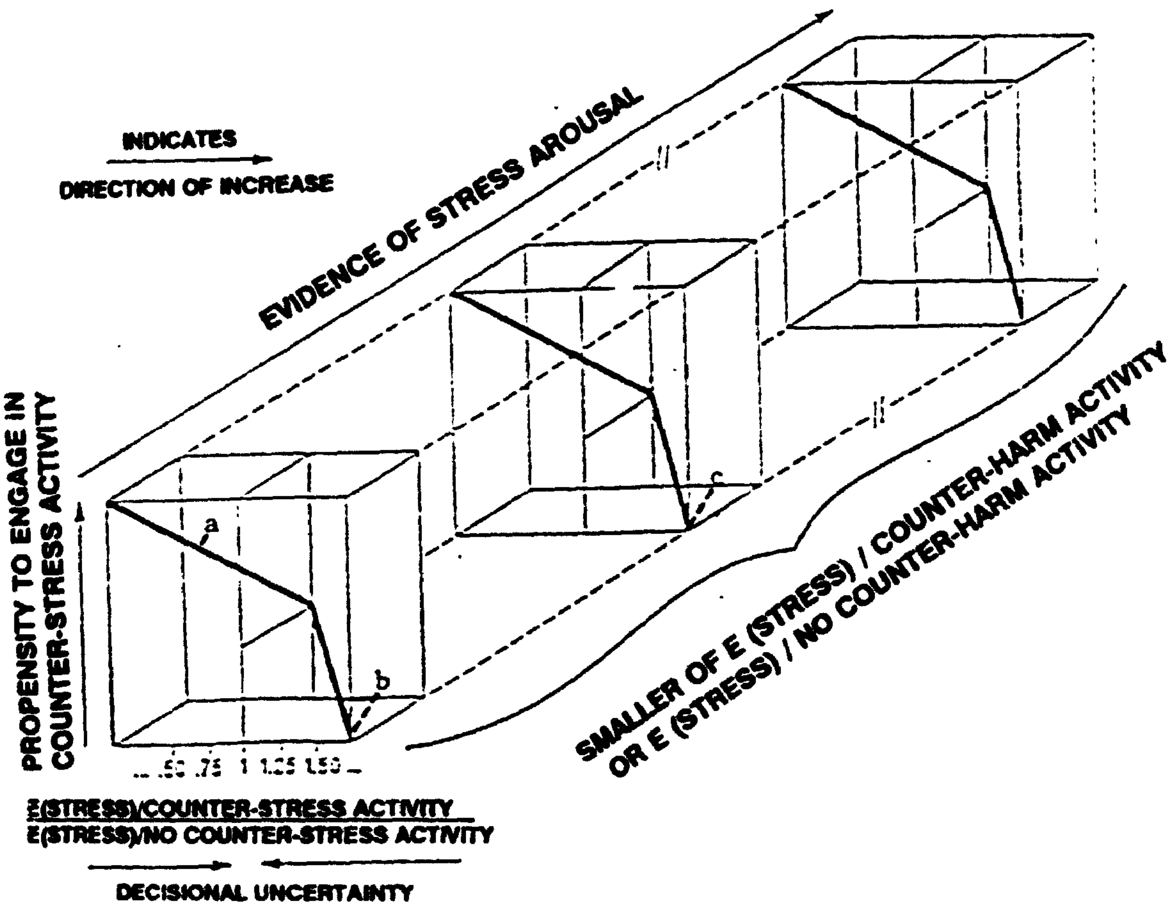


Figure 1-2. The choice/control model.

see Edwards, 1954), the derivation of expectancy values in terms of summed subjective probability-utility products will not be assumed in the present schema (Neufeld, 1982, p. 262). According to the findings referred to in the discussion of expected utility models, such derivations may not be appropriate, and may not render accurate estimates of subjects' stress expectancy judgments. Second, although no attempts have been made to identify the specific components of these stress expectancy values, certain predictive judgments, outlined earlier, would seem to be favoured as logical candidates. For example, judgments regarding event likelihood and intensity of stress impact would appear to be relevant to both numerator and denominator values. In addition, the effort required to engage in counterstress activity may be an additional consideration in the numerator.

Another construct of importance, within the present schema, is that of "anticipatory stress arousal". In Figure 1-2, the anticipatory stress arousal dimension can be seen to be represented along the third, or "depth" dimension. Empirically, it has been demonstrated that in the anticipatory stage, stress arousal is a positive function of stress expectancy. For example, when subjects have been presented with probability values representative of the likelihood of impending shock, levels of anticipatory stress arousal have corresponded to differences in the conveyed probabilities (e.g., see Grings & Sukonek, 1971; Niemela, 1969; Ohman, Bjorkstrand, & Ellstrom, 1973). Given these findings regarding the relation between stress expectancy and levels of anticipatory stress arousal, a second hypothesis forwarded by the choice/control model may be presented. According to the choice/control model, stress arousal largely will be a function of the smallest of the numerator or denominator stress expectancy values. This hypothesis is based on the assumption that the decision maker is aware of the alternative ratio values, and is inclined to select the option with the smallest stress expectancy value. Thus, the stress expectancy value associated with the future to be selected is conceptualized as the primary determinant of anticipatory stress. The remaining stress expectancy value will be deemed to be relatively uninfluential due to its association with the option to be rejected.

Additional Testable Implications of the Model. If anticipatory stress arousal indeed, is associated primarily with the smallest of the numerator or denominator stress expectancy components, certain associations between coping propensity and anticipatory stress arousal should hold. For example, it should be possible for coping propensity to remain invariant, despite certain changes in its constituent ratio values. This can be seen by comparing three, hypothetical ratios, say 1/2, 2/4, and 3/6. Although each of the aforementioned ratios has an identical numerical value, the smaller term in each ratio increases. Thus, according to the choice/control model, so also should evidence of stress arousal, despite the relative stability of coping propensity. This relationship is represented by the three, three-dimensional segments outlined in Figure 1-2. More specifically, it is represented by the points marked "b" and "c" in the foremost and middle segments. These points indicate examples of similar ratio values, but increasing levels of anticipatory stress arousal.

While coping propensity should, in certain circumstances, remain invariant, despite variations in stress arousal, it also should be possible for coping propensity to vary while stress arousal remains the same. In Figure 1-2, this relationship is represented by points "a" and "b" in the foremost three-dimensional segment. For purposes of explication, it might be assumed that these points are represented by the ratios 2/4 and 3/2, respectively. Although the smaller of the two ratio components remains fixed within each ratio, the ratio values do not remain invariant. Thus, the model would postulate that coping propensity should vary while the level of stress arousal remains the same. Within the foremost segment, this hypothesized relationship can be seen by moving from point "a" to point "b".

Although it is hypothesized in the model that stress arousal primarily will be a function of the smallest of the ratio components, it also is hypothesized that there will be certain increases in stress arousal as the value of the ratio approaches one. Increases in stress arousal in conjunction with increases in numerator and denominator similarity are postulated to be attributable to decisional uncertainty. That is, as these components grow closer, increments in stress arousal are presumed to occur as a result of conflict over response emission versus inhibition. On the right-hand side of each of the segments outlined in Figure 1-2, increased stress arousal is depicted as being accompanied by increases in coping propensity. This is attributable to the fact that as the ratio approaches one, the value of the cost of coping ratio decreases. On the left-hand side of the segments, coping propensity is seen as decreasing with increases in stress arousal. Here, as the ratio approaches one, the value of the ratio is increasing, causing decreases in coping propensity.

The aforementioned relations primarily are presented as a means of increasing understanding of the operation of the model. However, in actual empirical investigations, it is likely that opportunities for their assessment will be highly data-dependent in nature. For example, assessment of these relations requires spontaneous generation of highly specific constituent ratio values. In certain cases, it requires the generation of ratio data in which the values of certain components remain constant. Furthermore, it also requires generation of a large enough number of assessment-relevant values to conduct valid correlational analyses. The extent to which these criteria actually are met in empirical investigations is likely to vary substantially.

<u>Implications of the Present Research</u>

Although hypothesized determinants of coping propensity have been investigated from a dispositional approach, there have been few formal investigations of the determinants of coping behaviour from a decision theoretical perspective. Although previous investigators have intimated that decisional processes comprise important precursors to coping activity (e.g., see Fisher, 1986; Lazarus & Folkman, 1984; Schonpflug, 1986), within the stress domain, there have been few attempts to formulate these processes into stress-relevant decisional models. Thus, validation of the choice/control model may serve to integrate extant findings and provide a new framework for investigations of stress. For example, it may help elucidate the loci of abnormalities in coping determinants which potentially mediate the stress-pathology link (e.g., see Neufeld, 1982, for a discussion of the stress-psychopathology link). In the latter regard, it is possible that knowledge of decisional abnormalities will allow for investigations into their eventual modification. Considered from this perspective, the changes in decisional components outlined by the model may prove to be integral in treatment-outcome research. Furthermore, if accurate, the model may enhance our ability to predict coping probability and effectiveness. As was stated at the outset, the implications of these parameters for adjustment previously have been shown to be numerous. Finally, although the choice/control model was developed on the basis of careful integrations of both the stress and decisional literatures, it is possible that certain of its proposed relations will not hold up when subjected to empirical scrutiny. Here, it may be stated that there also would be advantages to negating seemingly cogent model-related hypotheses. Quite simply, it would reduce the probability of model assumptions being taken at face value, and prematurely, being assumed to be correct (e.g., see Neufeld, 1982).

Qualifications to the Present Body of Research

Prior to describing an overview of the validational studies, a number of qualifying comments are in order. These qualifications apply to both the research to be presented, and to the choice/control model itself. First, it will be hypothesized in the present work that the choice/control model is representative of a "universal" set of coherent decisional processes (e.g., see Roth & Cohen, 1986). That is, it will be contended that the model represents stress-relevant cognitive-decisional processes that are pertinent to all individuals in all stressful encounters. Thus, while it is possible that the behaviours ultimately stemming from these processes will change across both individuals and stressful situations, the underlying, motivating, cognitive processes themselves, will be assumed to be invariant and "universal".

Second, as the description of the model suggests, no attempt is being made to outline a formal subjective expected utility (SEU) model. That is, no attempt is being made, at either a theoretical or practical level, to examine specific probability and utility components. As Neufeld (1982) has suggested, it is perhaps somewhat premature to make specific conjectures about what these decisional components might be. In addition, global judgments may fare better than their componential counterparts, which empirically, often have not stood up well. Thus, in the present dissertation, emphasis will be placed on eliciting "global" stress expectancy judgments, which will be assumed to represent combinations of decisional components. Within the control literature, there clearly has been support for approaches of this nature. For example, it has been suggested that beliefs associate coping behaviours with some form of attribute or another (e.g., an outcome, a resource, etc.; see Ajzen, 1991). Thus, it should be possible to integrate coping beliefs about a given behaviour under a single summation to obtain a measure of the overall coping disposition. Although this approach runs the risk of blurring distinctions which may be important from both a theoretical and practical point of view (Ajzen, 1991), it could be argued that it is as worthy as the more componentially specific methodologies which have suffered from their own array of interpretive difficulties.

Finally, as the description of the model suggests, one of the central constructs being predicted is that of "coping propensity". As was stated earlier, coping propensity may defined as an "inclination" or "preparedness" to engage in counterharm activity (Neufeld, 1982). Thus, the real construct being investigated is the intent to engage in behaviour, and not actual coping behaviour itself. The importance of this distinction will be elaborated upon below, and will be addressed in later studies.

In studying coping propensity, there is the implicit assumption that coping propensity will translate into coping behaviour. As a general rule, this has been verified to be a supportable assumption at both the theoretical and practical levels. Theoretically, for example, intentions have been assumed to capture the motivational factors that ultimately influence subsequent behaviour (Ajzen, 1991). These include how hard individuals are willing to try, how much effort they are willing to exert, the duration of their responses, etc. At a practical level, intents also have been noted to translate into actual behaviours. This especially has been found to be the case when behaviours have posed no serious problems of control (e.g., Ajzen, 1991; Sheppard, Hartwick, & Warxhaw, 1988) and when one has had the option of choosing from among alternatives. For example, voting intentions have been found to correlat with voting choice in the range of .75 to .80 (Fishbein & Ajzen, 1981). Similarly, mothers' choices to breast or bottle feed infants have been shown to correlate .82 with intentions expressed several weeks prior to delivery (Manstead, Proffitt, & Smart, 1983).

However, equating intent with behaviour conceptually can be dangerous, although it frequently has been done within decision theory proper. Slovic and Lichtenstein (1972), for example, have suggested that judgments and decisions should be considered as being conceptually equivalent. The logic behind this assertion is that individuals presumably only will select an alternative if it is evaluated (i.e., judged) more highly than others. However, as Abelson & Levi (1985) have noted, the conceptual equivalence of judgments and choices can, and probably should, be continually questioned. They note that in contrast to judgments, choices imply much greater levels of commitment, a..d also tend to bring factors such as responsibility and regret to the fore. These factors can result in the decision maker ignoring his/her initial judgments, and ultimately, in making judgment-incongruent decisions. In the present body of work, the link between coping intentions and behaviours will be addressed in the laboratory validational study. Within the context of this study, both judgmental and behavioural data will be collected within the same testing paradigm.

Overview of the Present Body of Research

In the present dissertation, a variety of attempts were made to evaluate Neufeld's (1982) choice/control model. These attempts took place in the context of four model-relevant studies which differed in their methodologies and original motivations. The first study was designed to assess the validity of the choice/control model using an imaginal, questionnaire format. This format was deemed useful in terms of its ability to elicit stress-relevant cognitions across a wide variety of hypothetical stressful situations. The second study was designed to assess both model-validity and the "universal" quality of the choice/control model. Here, attempts were made to determine whether the situations utilized in Study One consistently were characterized by model-congruent profiles of model-relevant variables. The third study extended certain of the findings of Study Two by investigating the external validity of the derived situational profiles. In addition to evaluating profile validity, this study also attempted to enhance interpretation of certain "problematic" Study Two profiles. Finally, the fourth study was designed to assess the validity of the choice/control model in a more elaborate, laboratory context. The methodology utilized was intended to complement that used in Study One by including additional psychophysiological and behavioural measures.

CHAPTER 2. STUDY ONE

The first study was designed to assess the tenability of Neufeld's (1982) choice/control model using an imaginal questionnaire format. Three questionnaires specifically were designed for this study to tap the primary dimensions of the choice/control model. For ease and clarity of presentation, these questionnaires will be referred to as the "Cost Ratio" (CR), "Coping Propensity" (CP), and "Stress Arousal" (SA) questionnaires, respectively.

The CR, CP, and SA questionnaires used in the present study actually were modifications of extant versions of similar questionnaires used in previous, unpublished work. Items originally were generated by independently hired item writers, and were designed to represent empirically identified stress-relevant content domains outlined by Magnusson (1971) and Magnusson and Ekehammar (1973). Because it was the opinion of the present author that the formats of these original questionnaires made them unsuitable for testing the validity of the choice/control model, they subsequently were modified in order to meet the specific aims of validating the decisional framework. Below, are descriptions of the original questionnaire formats, followed by justifications for their modifications.

The Original CR Questionnaire. The intent of the original Cost Ratio (CR) questionnaire was to provide a vehicle for extracting stress expectancy judgments which corresponded to the numerator and denominator of the "cost of coping" ratio. The original questionnaire contained descriptions of 25 stressful scenarios, each of which was associated with a number of different coping options. In some scenarios, subjects were described as engaging in the accompanying coping option, while in other scenarios, they were described as not engaging in the accompanying coping option. Subjects were asked on the CR questionnaire to make judgments about the probability of stress given that they did or did not engage in the coping options.

Judgments regarding the probability of stress given engagement in a coping option were designed to represent the numerator of the "cost of coping" ratio (i.e., the expected value of stress, given coping activity; E(S)¦CA). In contrast, judgments regarding the probability of stress given lack of engagement in a given coping option were designed to represent the denominator of the "cost of coping" ratio (i.e., the expected value of stress, given no coping activity; E(S)¦NCA). The following two items, extracted from the original CR questionnaire, represent numerator and denominator judgments, respectively:

Numerator Judgment:

The main route to your destination is through a stretch of treacherous mountain highway. You take a circuitous route that is considerably longer.

Probability of stress in this situation:

1	2	3	4	5
Not Probable				**Very Probable**

Denominator Judgment:

There is a severe flu epidemic in your place of work. You do not get a flu vaccine.

Probability of stress in this situation:

1	2	3	4	5
Not Probable				**Very Probable**

A total of 77 scenario/coping option pairs were presented in random order throughout the questionnaire. The instructions for the original CR questionnaire, containing two example items, are presented in Appendix A.

The Original CP Questionnaire. The original Coping Propensity (CP) questionnaire used the same 77 scenario/coping option combinations as the original CR questionnaire. However, the intent of this questionnaire was to extract likelihood judgments which were representative of subjects' "intents" or "propensities" to engage in given coping behaviours. Thus, rather than being asked to rate the probability of stress given coping or no coping behaviour, subjects simply were asked to rate their likelihood of engaging in a particular coping option. Thus, the above two items from the CR questionnaire were presented in the following manner on the CP form:

The main route to your destination is through a stretch of treacherous mountain highway. You take a circuitous route that is considerably longer.

How likely are you to engage in this option (of taking a longer route?)

1	2	3	4	5
Not Likely				Very Likely

There is a severe flu epidemic in your place of work. You get a flu vaccine.

How likely are you to engage in this option (of getting a flu vaccine?)

1	2	3	4	5
Not Likely				Very Likely

Instructions for the original CP form, which include two example items, are presented in Appendix B.

The Original SA Questionnaire: The original Stress Arousal (SA) questionnaire used the same 77 scenario/option combinations as the CR and CP forms. This time, however, the intent was to assess the degree of stress subjects would feel in the face of the threatening situations. Subjects were informed that they could choose to engage in the coping option or not - the choice was entirely up to them. They were not, however, required to specify their choices on the original SA questionnaire. The aforementioned examples took the following form on the SA format:

The main route to your destination is through a stretch of treacherous mountain highway. You can take a circuitous route that is considerably longer.

How much stress would you experience under these circumstances?

1	2	3	4	5
No Stress			Extreme Stress	

There is a severe flu epidemic in your place of work. You can get a flu vaccine.

How much stress would you experience under these circumstances?

1	2	3	4	5
No Stress			Extreme Stress	

Instructions for the original SA questionnaire, containing two example items, are presented in Appendix C.

In summary, the original questionnaires were designed to extract data relevant to the primary dimensions of Neufeld's (1982) choice/control model. Judgments were intended to provide data for certain correlational analyses designed to assess the validity of hypothesized choice/control relationships. However, it was the opinion of the present author that these original questionnaires contained certain methodological and psychometric difficulties. It was felt that each of these difficulties ultimately would threaten to compromise data collected for purposes of model validation. Thus, a decision was made to revise the original questionnaires in order to make them more model-congruent self-report devices. In the four sections below, difficulties with the original questionnaires and their compensatory revisions will be discussed.

Problems with Impact and Post-Impact Versus Anticipatory Stress Expectancy Judgments: In many of the stressful circumstances described in the original questionnaires, the stressor contexts were described as presently occurring (e.g., "While cross-country skiing in a remote area, a severe storm suddenly hits"), or as having already occurred (e.g., "Unusual circumstances have resulted in your getting caught cheating on an exam"). Because the choice/control model is concerned with the anticipatory stress-transaction phase, these "impact" and "post-impact" stressful scenarios technically, would tend to blur the dimensional associations of principal interest. The types of stress expectancy judgments associated with probable and/or impending stressors [e.g., P(stressor occurrence), P(stress¦stressor occurrence), P(stress impact), etc.] do not apply in the "impact" and "post-impact" phases. In addition, the magnitude of such judgments could be hypothesized to be quite different in different stress transactional stages. For example, there may be a considerable difference between assessing the stressfulness of coping activity in the face of impending versus occurring stressors. In the latter situation, the greater "urgency" of the occurring stressor might decrease the magnitude of stress associated with coping. However, when stressors are only probable and/or impending, and are only more or less likely to occur, the stress associated with coping might be judged to be somewhat higher, as one cannot be certain that such activity will be necessary. A probable source of stress in the anticipatory situation would be conflict over response emission versus inhibition. Indeed, the existence of such incompatible tendencies has been demonstrated by certain stress researchers (e.g., see Janis & Mann, 1977) to engender substantial levels of stress arousal. Ambiguity during the anticipatory phase regarding response transaction additionally may increase the demands of successful response execution. Again, such a factor may act to elevate the stressfulness of coping activity in the anticipatory stress transaction stage.

Revision: On the original CR questionnaire, 14 scenarios rationally were judged to refer to "impact" or "post-impact" periods. These 14 scenarios, which are outlined in Appendix D, thus were reworded to be congruent with the anticipatory stress transaction phase. That is, scenarios were modified so as to be impending and/or more or less probable, versus occurring, or having already occurred. The following is an example of an "impact" to "anticipatory" revision using Item 12 from Appendix D.

Original: **You are sailing with an inexperienced friend and have gotten caught in extremely rough waters.**

Revision: **You are sailing with an inexperienced friend in waters that at times, can become extremely rough.**

Problems with Imbalances in the Number of Coping Options and Types of Stress Expectancy Judgments: An examination of the original CR, CP, and S_A questionnaires indicated that the number of coping options associated with each stressful scenario varied considerably. Referring to Appendix D, it can be seen that some stressful scenarios were associated with only two coping options (e.g., see Item 13), while others were associated with three (e.g., see Item 1) and even four (e.g., see Item 15) coping options. These types of imbalances inevitably would lead to a situation where some scenarios were being judged more frequently than others. The more frequently endorsed scenarios, in turn, would contribute greater "weight" to any ensuing statistical analyses.

In addition to problems with imbalances in the number of coping options, there also were problems with the types of stress expectancy judgments requested on the original CR questionnaire. The nature of this problem may be better understood by reviewing the structure of the "cost of coping" ratio.

According to the choice/control model, an individual contemplating a coping behaviour will have to make <u>two</u> types of stress expectancy judgments. That is, he/she will have to evaluate the stress associated with <u>engaging</u> in a given coping behaviour, and the stress associated with <u>not engaging</u> in a given coping behaviour. In short, he/she ultimately will have to make <u>two</u> complementary stress expectancy judgments in <u>each</u> threatening situation that portends. The ratio of these judgments, in any given situation, presumably will dictate ultimate coping propensity.

The aforementioned state of affairs has very specific implications for the format of the CR questionnaire. That is, it dictates clearly that each scenario/coping option pair be associated with <u>both</u> a numerator and denominator judgment, in accordance with the structure of the choice/control model. However, referring to Appendix D, it can be seen that on the original CR questionnaire, each scenario/coping option pair required only <u>one</u> type of stress expectancy judgment. That is, each pair required a judgment that was relevant to the numerator <u>or</u> denominator of the cost of coping ratio, but never both judgments in tandem. The rationale of the original questionnaire was that numerator and denominator judgments could be summed across situation/coping option pairs. These summary indexes then could be used to compute a single cost ratio representative of a subject's overall propensity to cope. However, the difficulty with this strategy is that it combines numerator and denominator judgments from entirely different stressful situations. Thus, numerator and denominator judgments were never related in a meaningful way via their relation with the same situation. One would predict that this would result in an incomplete or distorted cost ratio having little utility or validity.

Revisions: In order to address the imbalances in the number of coping options associated with each stressful scenario, two coping options ultimately were selected and retained for each of the 25 scenarios. Existing options were eliminated if they were similar to other options and/or if they contained inappropriate grammar and/or word tenses. In cases where none of the existing options seemed appropriate, new ones were generated by the present author.

In order to address the problem of incompatible numerator and denominator judgments on the original CR questionnaire, both types of judgments were requested on the revised questionnaire for each scenario/coping option pair. This resulted in each scenario being endorsed a total of four times, for a total of 100, versus 77, stress expectancy judgments. The following is an example of a representative revision using Item 4 from Appendix D.

> Original Scenario: **It is suspected that a large company has been dumping hazardous chemicals into the river system in your area.**
>
> Original Coping Options:
> **(a) You do not help to organize a public action committee to investigate the company's practices.**
> **(b) You do not sell your home and move away.**
> **(c) You do not bring the issue to the attention of local politicians and the media.**
>
> (Subjects were required to indicate the probability of stress in each of the above situations)
>
> Revised Scenario: **You hear that a large company will be dumping hazardous chemicals into the river system in your area.**
>
> Revised Coping Options:
> **(a) You can help organize a public action committee to investigate the company's practices.**
> **(b) You can sell your home and move away.**

(Subjects were required to indicate how likely they would be to experience stress if they did and did not engage in the above coping options)

Problems With Imbalanced Reversals and Incomplete Specifications of Rating Scale Anchors: On all three of the original CR, CP, and SA questionnaires, imbalances in the reversals of the rating scale anchors were apparent. Because these imbalances were similar across each of the three questionnaires, only one questionnaire will be used as an example.

On the original CR questionnaire, subjects were asked to make stress expectancy judgments using a 5-point rating scale. This 5-point scale was anchored by either "No Stress" or "Extreme Stress" at the low and high ends, respectively (refer to Appendix A for examples). In 21 of the original 77 scenarios, "No Stress" was given a value of 5. However, in the remaining 56 scenarios, which comprised 73% of the total, "No Stress" was given a value of 1. Thus, the anchors on the rating scales at times, appropriately were reversed, however, they were not reversed in a balanced fashion. The problem with such imbalances is that they can cause interpretive problems when subjects exhibit tendencies toward certain response biases. For example, if a group of subjects predisposed to endorse low rating scale values were to endorse the original CR questionnaire, an analysis of the magnitude of stress expectancy judgments would indicate relatively low stress expectancy levels. It would be difficult, in such a case, to determine whether subjects' ratings were attributable to their perceptions of scenario content; for they equally could be attributable to subjects' unrelated tendencies to endorse low, versus high, scale values.

In addition to imbalanced reversals, problems also potentially were created by labelling only two anchors of the five rating demarcations. Although this problem was not severe, it nonetheless may have led to decreased reliability by encouraging varied interpretation of numerical scale values. For example, certain subjects may have interpreted a numerical rating of "4" as being representative of

"Considerable Stress". Others, however, may have associated quite a different level of stress with this same numerical rating. To the extent that there were differences in the meanings of numerical values there would have been reductions in the homogeneity of judgments. This reduced homogeneity in turn, may have led to reduced reliability both within and between testing sessions.

Revisions: To address the imbalances in the reversals of anchors, the latter simply were reversed an equal number of times. Thus, for half the judgments, the "low" anchor represented the lowest numerical value, and for the other half it represented the highest. Reversals were distributed randomly across pages to avoid tendencies toward biased responding.

Lack of anchor labelling was addressed by attaching specific verbal anchors to each numerical value on the scale. Although such labelling does not necessarily eliminate inconsistency in meaning (e.g., "Extreme Stress" may still mean different things to different subjects). it may at least act to reduce it considerably. Likelihood judgments also were substituted for probability judgments on the original CR scale. They captured similar information, yet seemed to be considerably easier for subjects to comprehend. Finally, 9-point scales were substituted for 5-point scales in order to encourage increased variability in responding. It was determined that such scales would be more sensitive to the finer distinctions that often occur among subjects' judgments. Refer to Appendix E, which contains the Revised CR Questionnaire, for examples of the above modifications.

Problems With Vague/Ambiguous Instructions: Certain features of the instructions on the original questionnaires appeared to be vague or ambiguous. Thus, questionnaire instructions were made more specific so as to avoid confusion regarding primary tasks. In the original instructions, scenarios from the body of the questionnaire also were presented to subjects as examples. Because use of these scenarios resulted in a higher frequency of their presentation, they were replaced with new "demonstrator" examples. In addition to new examples, brief descriptions of their meanings also were added to the original instructions. The intent here was to enhance further the clarity of the instructions, as well as the meaning of the rating scale values. Original instructions for the three questionnaires are presented in Appendices A through C. Revised instructions, containing the aforementioned changes, are presented in Appendices E through G.

Presentation of the Scenario/Option Pairs and Outline of the Corresponding Response Sheets: Once the original CR, CP, and SA items were revised, a decision had to be made regarding the appropriate presentation of items on the questionnaires. In order to avoid potential carry over effects resulting from similar orderings of questionnaire items, three different orderings of the scenario/option pairs were generated for the CR, CP, and SA formats. These orders were generated in the following manner. First, scenario/coping option pairs were arranged in completely random order throughout the CR questionnaire. This initial random ordering was then used to generate two "quasi-random" orderings for the CP and SA questionnaires. Specifically, this was accomplished by twice rearranging the pages from the CR questionnaire. The resulting item rearrangements were then used to order the scenario/option pairs for the CP and SA questionnaires. Thus, from the perspective of the subject, the items on the three questionnaires appeared to be arranged in three different random orders. However, items also were arranged such that after a simple recollating of pages, data could be input in an identical order. For purposes of data input, a decision was made to enter item responses in the order outlined on the CR questionnaire.

Response sheets were designed so that there were clear demarcations between the response blanks for different questionnaire pages. Examples of this response blank grouping can be seen by referring to Appendix E, the Revised CR Questionnaire, and Appendix H, the corresponding CR Response Sheet. Appendices I and J outline the corresponding response sheets for the CL and SA questionnaires, respectively. The numbers to the right of the response blank groups (which represent different pages of the questionnaires) indicate the order in which data was input.

Overview of Study One

The intent of Study 1 was to elicit self-report judgments relevant to the dimensions of the choice/control model. It was then further to determine whether these self-report judgments were related in a model-congruent way. Specifically, it was hypothesized that the "cost of coping" Ratio would be inversely related to Coping Propensity. Additionally, it was predicted that Stress Arousal would be related to the smallest of the Numerator or Denominator components. It was determined that the imaginal format would provide an effective preliminary means of assessing the tenability of these choice/control hypotheses. The imaginal format successfully has been used by other stress researchers to examine various stress-relevant issues (e.g., see Ekehammer, Schalling, & Magnusson, 1975; Hodges & Felling, 1970; Magnusson & Ekehammer, 1975). The strength of the imaginal format is that it allows for assessments of cognitive judgments about behaviour in diverse situations. In addition, it allows for assessment of reported behaviour in situations that ethically could never be assessed in vivo. Although certain authors have suggested that subjects may have difficulty imagining themselves or their reactivity in imaginal situations (e.g., Andrasik, Turner, & Ollendick, 1980; Hodgson & Rachman, 1974), it is unlikely that subjects respond completely randomly to such situations, without any reference to underlying cognitive patterns. If this were the case, results from imaginal studies would rarely conform to theoretical predictions. Within the stress domain, one could hardly draw the conclusion that random results have been the empirical trend. Furthermore, assessments of predicted cognitive patterns are of crucial importance in a field committed to the concept of cognitive appraisal. Such appraisals have been demonstrated to influence the definition of stress itself (e.g., see Lazarus & Folkman, 1984), in addition to the formulation of stress-relevant behaviours.

Method

Subjects

A total of 156 subjects (78 males, 78 females) from the University of Western Ontario participated in the questionnaire study. One hundred and eighteen of these subjects (56 males and 62 females) participated in partial fulfilment of an introductory psychology course credit. Thirty-eight of these subjects (22 males and 16 females) participated as part of their involvement in the Summer Subject Pool. This latter set of subjects received a remuneration of $7 for each study session in which they participated.

Procedure

Testing took place in two 1-hour group sessions. Each testing session was separated by exactly two weeks. During the first testing session, subjects were required to complete the CR, CP, and SA questionnaires. The three model-relevant questionnaires were distributed randomly to subjects in 1 of 6 possible orders (i.e., CR-CP-SA; CR-SA-CP; CP-CR-SA; CP-SA-CR; SA-CR-CP; SA-CP-CR). The only stipulations were that each order had to be completed by an equal number of subjects, and that an equal number of males and females had to complete each order. Thus, 13 males and 13 females completed each of the orders 1 through 6. This resulted in each of the six possible orders of the questionnaires being completed by a total of 26 subjects.

In order to determine whether subjects were engaging in socially desirable or pseudo-random responding, they also were required, during the first testing session, to complete the Personality Research Form (PRF; Jackson, 1984) Desirability and Infrequency scales. Half the subjects completed the Desirability and Infrequency scales prior to completing the three model-relevant questionnaires, and half completed these scales subsequent to completing the model-relevant questionnaires.

In order to evaluate the test-retest reliabilities of each of the model-relevant questionnaires, subjects also were required to complete the CR, CP, and SA formats during the second testing session. As was the case in the first testing session, questionnaires were distributed to subjects in 1 of 6 possible random orders. Subjects were not required to complete the PRF Desirability and Infrequency scales during the second testing session, as the test-retest reliabilities of these scales previously have been established (e.g., see Jackson, 1984).

Results

In a preliminary analysis of the 50 situation/coping option pairs, it was discovered that the coping options on items 4 and 13 were not consistent across the CR, CP, and SA forms. Because it was desired that each form contain identical situation/coping option pairs, and that each stressful situation be presented an equal number of times, these aberrant items, in addition to their situational counterparts (i.e., items 40 and 42, respectively) were deleted from the CR, CP, and SA forms. Thus, all statistical analyses for the questionnaire study were based on a pool of 46 situation/coping option pairs.

Assessment of Biased Responding

In order to detect the presence of potentially random responding on the CR, CP, and SA questionnaires, scores on the PRF Infrequency scale were summed for each of the 156 subjects. High Infrequency scale scores previously have been associated with possible "person unreliability", and typically indicate the discarding of potentially "deviant" data from the original data pool. Results of the summation procedure revealed no Infrequency scale score greater than two, thus justifying retention of all the original questionnaire data.

In order to determine whether there were trends toward socially desirable responding on the CR, CP, and SA questionnaires, scores on the PRF Desirability scales were correlated with the sums of scores on the four model-relevant variables assessed by these questionnaires. For clarity of presentation, these variables will be referred to as the

Numerator [E(S)¦CA], Denominator [E(S)¦NCA], Coping Propensity (CP), and Stress Arousal (SA) variables, respectively. Thus, for each of the 156 subjects, a Numerator, Denominator, Coping Propensity, and Stress Arousal score was calculated by summing responses across the 46 situation/coping option pairs. The correlations between the PRF Desirability and Infrequency scores and the sums of scores on the four model-relevant variables are outlined in Table 2-1. As the low correlations in Table 2-1 indicate there was no evidence to support the presence of either socially desirable or random responding. It may be concluded from these results that responses likely were based on the content of the questionnaire items, rather than on content-irrelevant, item endorsing strategies.

Assessment of Order Effects

In order to detect the presence of possible order effects due to the different orders of completion of the questionnaires, four split-plot factorial analyses of variance were conducted on the Numerator [E(S)¦CA], Denominator [E(S)¦NCA], Coping Propensity (CP), and Stress Arousal (SA) variables, respectively. Because the within-block assumption of sphericity was violated within each of these tests (e.g., see Kirk, 1982), corrections for violations were performed by adjusting the within-subject degrees of freedom using the Huynh-Feldt epsilon (see Huynh & Feldt, 1976). This correction avoids the difficulties of excessive conservatism and reduced power associated with the Geisser-Greenhouse epsilon (Geisser & Greenhouse, 1958) while still serving to adequately control Type I error rate (Rogan, Keselman, & Mendoza, 1979). Univariate summary tables for each of the four variables are presented in Tables 2-2 through 2-5.

As Tables 2-2 through 2-5 indicate, there were no main effects for Order for any of the model-relevant variables. Although there were statistically significant Item x Order interactions for the Denominator, Coping Propensity, and Stress Arousal variables, the proportions of variance accounted for by these effects (i.e., .5%, 1.8%, and 1.2%,

Table 2-1

Correlations Between the Four Model-Relevant Variables[a] and the PRF Desirability Scale Scores

	PRF Desirability
Numerator	-.14
Denominator	-.06
Coping Propensity	.14
Stress Arousal	-.06

[a] Scores on the four model-relevant variables are the sums of scores across the 46 stressful situations

Table 2-2

Test for Order Effects: Analysis of Variance Summary Table for the Numerator -- [E(S)¦CA]

Source	df	MS	F	% of Variance Accounted For By Effect
Sex (A)	1	123.92	4.02*	.5
Order (B)	5	29.01	.94	.0
A X B	5	12.52	.41	.0
Within Cells	144	30.82		10.6
Items (C)[a]	34.12	238.75	48.54**	20.5
A x C	34.12	11.61	2.36**	.2
B x C	170.60	5.21	1.06	.1
A x B x C	170.60	4.71	.96	.2
Within Cells	4913.33	4.90		67.1

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

[a] Huynh-Feldt ϵ for tests involving "Items" (C) within-subjects effect = .75823

Table 2-3

Test for Order Effects: Analysis of Variance Summary Table for the Denominator -- [E(S)|NCA]

Source	df	MS	F	% of Variance Accounted For By Effect
Sex (A)	1	595.39	13.78**	3.7
Order (B)	5	19.20	.44	.0
A X B	5	16.97	.39	.5
Within Cells	144	43.22		21.6
Items (C)[a]	34.79	68.31	20.09**	6.9
A x C	34.79	11.98	3.52**	2.1
B x C	173.97	4.10	1.21*	.5
A x B x C	173.97	3.37	.99	.0
Within Cells	5010.47	3.40		64.3

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

[a] Huynh-Feldt ϵ for tests involving "Items" (C) within-subjects effect = .77322.

Table 2-4

Test for Order Effects: Analysis of Variance Summary Table for Coping Propensity (CP)

Source	df	MS	F	% of Variance Accounted For By Effect
Sex (A)	1	206.39	6.39*	3.7
Order (B)	5	41.04	1.27	.0
A X B	5	19.57	.61	.5
Within Cells	144	32.29		21.6
Items (C)[a]	39.56	320.79	59.74**	23.9
A x C	39.56	17.10	3.18**	1.8
B x C	197.78	9.16	1.71**	1.7
A X B x C	197.78	5.33	.99	.0
Within Cells	5695.92	5.37		63.5

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

[a] Huynh-Feldt ϵ for tests involving "Items" (C) within-subjects effect = .87900

Table 2-5

Test for Order Effects: Analysis of Variance Summary Table for Stress Arousal (SA)

Source	df	MS	F	% of Variance Accounted For By Effect
Sex (A)	1	109.89	4.39*	.5
Order (B)	5	27.13	1.08	.0
A X B	5	16.80	.67	.6
Within Cells	144	25.03		12.7
Items (C)[a]	39.18	127.36	43.17**	18.0
A x C	39.18	5.40	1.83**	.7
B x C	195.89	4.36	1.48**	1.2
A x B x C	195.89	2.69	.91	.0
Within Cells	5641.55	2.95		66.6

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

a Huynh=Feldt ϵ for tests involving "Items" (C) within-subjects effect = .87061 respectively) indicate that they were of no practical or interpretive significance. Similar conclusions may be drawn about the main effects for Sex for all four model-relevant variables.

Of those effects outlined in Tables 2-2 through 2-5, it was only the main effect for Items which was of both statistical and practical significance for each variable. Although such main effects normally warrant further investigation, this was deemed unnecessary in the present case for two reasons. First, differences between item responses were both expected and desired in the present case. Second, knowledge of where exactly these differences occurred was of little interpretive significance to the remainder of the questionnaire analyses. Thus, for the aforementioned reasons, no further exploration of the Item main effect was undertaken.

Assessment of the Situation/Coping Option Pairs as the Appropriate Units of Analysis

Within the questionnaire study, there were two possible methods of aggregating data to construct model-relevant variables. That is, data for each variable could be aggregated either across the 156 subjects, or across the 46 stressful situations. The former method of aggregation would result in the 46 situation/coping option pairs being the primary units of analysis. This level of aggregation would be appropriate when interest was in determining whether model-relevant predictions held across different types of stressful situations. The latter method of aggregation would result in the 156 subjects being the primary units of analysis. This level of aggregation would be appropriate when interest was in determining whether model-relevant predictions held across the group of subjects sampled.

Given the overwhelming focus on person variables and individual differences within the stress and coping literature, one of the goals of the present work was to examine the choice/control model in light of different types of stressful situations. One of the goals of Study Two, for example, was to determine whether the profiles of model-relevant variables across the 46 situation/coping option pairs conformed to the profiles predicted by the choice/control model. As was stated earlier, this would be the expected result if the choice/control model indeed were representative of a "universal" cognitive-decisional schema. Thus, it was deemed desirable to conduct remaining statistical analyses using the questionnaire items as the units of analysis. That is, it was deemed desirable to collapse model-relevant variable values across the 156 subjects, and to use the mean values of the Numerator, Denominator, Coping Propensity, and Stress Arousal variables for each of the 46 stressful situations as the basic units of analysis.

Although the chosen method of aggregation easily could be justified at a substantive level, some preliminary analyses had to be conducted before it also could be justified at an empirical level. In order to justify empirically the collapsing of responses across subjects, it was deemed necessary to demonstrate that responses to model-relevant variables were relatively homogeneous across subjects, or that subjects' responses to each of the model-relevant variables conformed to a single point of view.

Points of View Analysis. In order to determine whether there were strong perceptual individual differences associated with the Numerator, Denominator, Coping Propensity, and Stress Arousal judgments, a "points of view" analysis (e.g., see Tucker & Messick, 1963) was performed on each of the model-relevant variables. From a conceptual perspective, a points of view analysis may be conceived of as a means of estimating the proximity of subjects to one another on the basis of their individual profiles of variable ratings. Although points of view analysis is similar to factor analysis in that it attempts to simplify complex subject/variable relationships, it also differs from factor analysis in at least two important respects. First, factor analysis analyzes the relationships between variables, whereas points of view analysis analyzes the relationships between subjects. Second, factor analysis is based on an input matrix of variable intercorrelations, whereas points of view analysis is based on an input matrix of sums of squares and cross products of raw measures. According to Tucker and Messick (1963), use of a matrix of sums of squares and cross products results in the retention of mean values (centroids) on the analyzed variables. Thus, the first extracted point of view may be interpreted as representing the "average person" within the subject group. As Tucker and Messick (1963) note, extraction of an average point of view allows for the identification of further systematic individual differences which may not necessarily be expressed in the simple mean rating values. That is, subgroups of individuals whose responses are not represented by the means of the average subject may be identified by additional extracted points of view.

As a first step in the points of view analysis, a 156 x 156 matrix of intersubject cross products of ratings was computed for each of the Numerator, Denominator, Coping Propensity, and Stress Arousal variables. Then, a principal components (points of view) analysis was performed on each matrix of ratings over the 46 stressful situations. Eigenvalues associated with the first 5 of the 156 extracted principal components are presented for each variable in Table 2-6. Because of the small decrements between eigenvalues for the second and subsequent principal components, it was determined that only these first five eigenvalues need be presented.

As the eigenvalues in Table 2-6 indicate, the first principal component (i.e., point of view) clearly accounted for the greatest proportion of variance among subjects. In fact, across the four model-relevant variables, eigenvalues for the first point of view were anywhere from 71 (for the Numerator variable) to 177 (for the Denominator variable) times larger than eigenvalues for the second and subsequent extracted points of view. Furthermore, the 156 subject loadings themselves were all double-digit values on the first principal component. The remaining principal components were never associated with subject loadings beyond single-digit values. It thus may be

Table 2-6

Eigenvalues Derived from the Points of View Analyses of the Numerator, Denominator, Coping Propensity, and Stress Arousal Variables

	Eigenvalues[a]				
Principal Component	I	II	III	IV	V
Numerator	193,045	2,701	2,158	1,624	1,231
Denominator	329,120	1,854	1,206	1,101	1,042
Coping Propensity	272,718	2,497	2,121	1,942	1,770
Stress Arousal	220,798	1,423	1,152	995	938

[a] Because of the small decrements between eigenvalues for the second and subsequent principal components, eigenvalues are reported for the first 5 of the 156 principal components only.

concluded that one "average" point of view adequately represented subjects' responses across the 46 stressful situations, and that there was an empirical justification for collapsing variable ratings across the 156 subjects.

Assessment of Test-Retest Reliabilities

Of the 156 subjects (78 males, 78 females) who participated in a first testing session, 113 (53 males, 60 females) returned for a second testing session. This translated into a return rate of approximately 72%. For these 113 subjects, test-retest reliabilities were calculated in the following way. First, for both Time 1 and Time 2 data sets, mean values on the Numerator, Denominator, Coping Propensity, and Stress Arousal variables were calculated for each of the 46 stressful situations. Test-retest reliabilities then were calculated for each variable by correlating Time 1 and Time 2 mean values. Results of this analysis indicated extremely high test-retest reliabilities for the Numerator, Denominator, Coping Propensity, and Stress Arousal variables. These were, respectively, .98, .96, .98, and .96. Although the magnitude of these values partially is attributable to the fact that they are based on aggregated scores, they nonetheless, attest to the fact that subjects perceived the 46 stressful situations in a similar manner across a two-week period.

Calculation of the Ratio Variable

Prior to executing hypothesis-relevant correlational analyses, an appropriate means of calculating the fifth model-relevant variable - the Ratio variable - had to be determined. In preliminary, exploratory analyses, two methods were used to compute the Ratio variable. In one method, a "ratio of averages" was generated by dividing the mean Numerator judgment by the mean Denominator judgment for each of the 46 stressful situations. In the other method, an "average ratio" was generated by calculating a ratio for each situation, for each subject, and then collapsing the resulting ratios for each situation across the 156 subjects. Although analysis indicated an extremely high degree of congruence between the two forms of the ratio (r = .93, p < .01), the "average ratio" was chosen for analysis for two primary reasons. First, and perhaps most importantly, the computation of the average ratio variable involved the same method of aggregation as the Numerator, Denominator, Coping Propensity, and Stress Arousal variables. Consistent levels of analysis are desirable in any empirical study (e.g., see Lees & Neufeld, in press) in both the creation and utilization of computational units.

Second, empirical evidence that the average ratio adequately represented subjects' ratio ratings was achieved via a points of view analysis of the average ratio variable. As was the case with the four other model-relevant variables (i.e., see "Points of View Analysis" above), the eigenvalue associated with the first extracted principal component in this analysis was substantially larger than the eigenvalues associated with the second and subsequent principal components. The eigenvalues for the first five principal components were, respectively, 7475, 837, 578, 493, and 355. Thus, the first eigenvalue was at least nine times larger than the second and subsequent values, while the second and subsequent values were at most, only one and a half times larger than their subsequent counterparts. Not only did this suggest that one point of view was dominant among the set of 156 points of view, but it also suggested that the "average ratio" variable effectively captured this "average" point of view.

Assessment of the Choice/Control Hypotheses

The correlations between the five model-relevant variables are outlined in Table 2-7. As can be seen from this table, the two primary hypotheses forwarded by the choice/control model were supported in the questionnaire data. That is, as predicted, Coping Propensity was inversely related to the cost of coping Ratio (r = -.59), and Stress Arousal was most highly correlated with the Numerator (r = .91), the smallest of the two Ratio components. In preliminary analyses, it was found that the Numerator of the cost of coping Ratio was significantly

Table 2-7

Correlations Between the Five Model-Relevant Variables

	Numerator [E(S)¦CA]	Denominator [E(S)¦NCA]	Coping Propensity	Stress Arousal	Ratio
Numerator		.35	-.41	.91	.75
Denominator			.31	.47	-.27
Coping Propensity				-.47	-.59
Stress Arousal					.57
Ratio					

smaller than its Denominator counterpart (i.e., Numerator $M = 5.01$; Denominator $M = 6.68$, $t(45) = -11.01$, $p < .01$). A total of 43 out of 46 of the original stressful situations (93%) conformed to this Numerator-Denominator pattern.

In addition to being supportive of the two primary choice/control hypotheses, the correlations in Table 2-7 also were supportive of other relationships that logically would be predicted by the choice/control model. In accord with choice/control predictions, the negative Numerator/Coping Propensity association ($r = -.41$) suggested that as the stress expectancy associated with coping activity increased, coping propensity decreased. Conversely, the positive Denominator/Coping Propensity association ($r = .31$), although relatively low in terms of magnitude, suggested that as the stress expectancy associated with no coping activity increased, coping propensity also increased. The positive Numerator/Ratio association ($r = .75$) suggested that as the stress expectancy associated with coping activity increased, so also, did the ratio of coping to no coping. Given that increases in the Ratio are associated with decreases in Coping Propensity, this relationship also is in the predicted direction. The negative Coping Propensity/Stress Arousal ($r = -.47$) correlation indicated that as one's reported inclination to engage in active counterharm activity increased, one's reported anticipatory stress arousal decreased. This appears to be congruent with the notion that one generally will engage in counterharm activity when it constitutes a relatively less, versus more, stressful option. Finally, the positive Stress Arousal/Ratio association was also model-congruent and in accord with the Coping Propensity/Stress Arousal interrelation. It suggested that as reported anticipatory stress arousal increased, so also did the Cost of Coping Ratio, in conjunction with predicted decreases in Coping Propensity.

Differences Between Hypothesis-Relevant and Potentially Competing Correlations

As the correlations in Table 2-7 suggest, the two primary hypotheses forwarded by the choice/control model were supported by the questionnaire data. Because each of these primary hypotheses involved some combination of the Numerator, Coping Propensity, Stress Arousal, and Ratio variables, and because there were potentially high levels of conceptual overlap between certain of these model-relevant variables, differences between hypothesis-relevant correlations and sets of potentially competing counterparts had to be established in order to enhance the interpretive validity of the former. Given the moderate association between Stress Arousal and Coping Propensity (r = -.47) for example, it had to be established that the Ratio/Coping Propensity correlation (r = -.59) differed significantly from the Ratio/Stress Arousal correlation (r = .57), and that the Stress Arousal/Numerator correlation (r = .91) also differed significantly from the Coping Propensity/Numerator correlation (r = -.41). Furthermore, given the high degree of association between the Ratio and Numerator variables (r = .75), it also had to be established that the Ratio/Stress Arousal correlation (r = .57) differed significantly from the Numerator/Stress Arousal correlation (r = .91) and that the Coping Propensity/Ratio correlation (r = .-.59) differed significantly from the Coping Propensity/Numerator correlation (r = -.41).

The statistical significance of differences between the aforementioned sets of correlations was assessed using the Z-statistic outlined by Dunn & Clarke (1969). Like Hotelling's t (e.g., see Marascuilo & Levin, 1983), this statistic is designed to test the null hypothesis that the correlation between Variables A and B is equal to the correlation between Variables A and C. The four Z-statistics corresponding to the four null hypotheses of interest are outlined in Table 2-8. As can be seen from Table 2-8, all hypothesis-relevant correlations differed significantly from potentially competing counterparts.

In addition to establishing that there were significant differences between hypothesis-relevant and potentially competing

Table 2-8

Assessments of Significance of Differences Between Hypothesis-Relevant and Potentially Competing Correlations

Null Hypothesis	$\underline{Z}$-statistic
Ho: $r_{\text{Ratio/Coping Propensity}} = r_{\text{Ratio/Stress Arousal}}$	-13.52*
Ho: $r_{\text{Stress Arousal/Numerator}} = r_{\text{Coping Propensity/Numerator}}$	-18.24*
Ho: $r_{\text{Ratio/Stress Arousal}} = r_{\text{Numerator/Stress Arousal}}$	- 7.49*
Ho: $r_{\text{Coping Propensity/Ratio}} = r_{\text{Coping Propensity/Numerator}}$	-26.70*

*$p < .01$, two-tailed

correlations, it also was deemed important to establish that the relative magnitudes of the hypothesis-relevant correlations differed significantly from the magnitudes of potentially competing counterparts. Thus, using the same sets of correlations as outlined above, an attempt was made to demonstrate: (a) that the magnitude of the Ratio/Coping Propensity correlation was greater than the magnitude of the Ratio/Stress Arousal correlation; (b) that the magnitude of the Stress Arousal/Numerator correlation was greater than the magnitude of the Coping Propensity/Numerator correlation; (c) that the magnitude of the Stress Arousal/Numerator correlation was greater than the magnitude of the Stress Arousal/Ratio correlation; and (d) that the magnitude of the Ratio/Coping Propensity correlation was greater than the magnitude of the Numerator/Coping Propensity correlation. Each of these hypotheses was tested using the Dunn-Clarke Z-statistic (Dunn & Clarke, 1969) with directional signs removed from all correlations.

Results of the "magnitude" analysis are presented in Table 2-9. These results suggest that in 3 out of 4 cases, the magnitudes of the hypothesis-relevant correlations were significantly larger than the magnitudes of potentially competing counterparts. Thus, in accord with the choice/control model, it may be concluded that: (a) the proportion of variance in the Numerator variable linearly explained by Stress Arousal was greater than that explained by Coping Propensity; (b) the proportion of variance in the Stress Arousal variable linearly explained by the Numerator was greater than that explained by the Ratio; and (c) the proportion of variance in the Coping Propensity variable linearly explained by the Ratio was greater than that explained by the Numerator. In contradiction to choice/control predictions, the magnitude of the Ratio/Coping Propensity correlation did not prove to be significantly larger than the magnitude of the Ratio/Stress Arousal correlation. Thus, it cannot be concluded that the variance of the Ratio variable was linearly explained by the Coping Propensity variable to any greater degree than it was by the Stress Arousal variable. Although this may

Table 2-9

Assessments of Significance of Differences Between Magnitudes of Hypothesis-Relevant and Potentially Competing Correlations

Alternative Hypothesis	Z-statistic
Ha: $r_{Ratio/Coping\ Propensity} > r_{Ratio/Stress\ Arousal}$	.18
Ha: $r_{Numerator/Stress\ Arousal} > r_{Coping\ Propensity/Numerator}$	7.88*
Ha: $r_{Numerator/Stress\ Arousal} > r_{Ratio/Stress\ Arousal}$	7.19*
Ha: $r_{Coping\ Propensity/Ratio} > r_{Coping\ Propensity/Numerator}$	4.85*

*$p < .01$, one-tailed

present certain difficulties for the interpretation of the Ratio/Coping Propensity correlation, these may be offset to a certain degree by the fact that the two sets of correlations involved originally were in different, logically predicted directions, and by the fact that in their signed forms, they were significantly different.

Canonical Correlation Analysis of Model-Relevant Variables

Although the matrix of correlations outlined in Table 2-7 supported the two individual, primary hypotheses forwarded by the choice/control model, it did not speak to the extent to which the Coping Propensity and Stress Arousal variables linearly could be predicted or "explained" by the set of Numerator, Denominator, and Ratio variables. Since model-congruent prediction of these constructs also is of relevance to assessing the validity of the choice/control model, a canonical correlation analysis (e.g., see Marascuilo & Levin, 1983; Thompson, 1984) was performed treating the Numerator, Denominator, and Ratio variables as predictor variables, and the Coping Propensity and Stress Arousal variables as predicted variables.

A test of the canonical omnibus no-relationship hypothesis based on two pairs of canonical variates indicated that the aforementioned sets of model-relevant variables were statistically related [Wilks' Lambda(6,82) = .0706, $p < .01$]. Follow-up sequential tests, based on Rao's F approximation (e.g., see Marascuilo & Levin, 1983), additionally indicated that the two extracted pairs of canonical variates reasonably could be retained for interpretation. Results of this sequential analysis are outlined in Table 2-10.

Interpretation of the First Canonical Variate Pair. The structure coefficients, canonical correlations, and eigenvalues from the canonical analysis are outlined in Table 2-11. An examination of the structure coefficients associated with the first canonical X variate ($X^{(1)}$) indicates that the original Numerator variable was most highly correlated with this X variate (r = .944), followed by the original Denominator (r = .637) and Ratio (r = .498) variables. This first

Table 2-10

Sequential Tests of Significance of Canonical Variate Pairs Based on Rao's F

	Wilks' Lambda	F	Num df	Den df	p
1[a]	.0706	37.7645	6	82	.0001
2[b]	.6253	12.5858	2	42	.0001

Note: Rao's F is exact.
[a] Ho: Lambda 1 = Lambda 2 = 0
[b] Ho: Lambda 2 = 0

Table 2-11

Structure Coefficients, Canonical Correlations, and Eigenvalues from Canonical Analysis of Model-Relevant Variables

	Structure Coefficients					Canonical	
	Num	Den	Ratio	SA	CP	R	Eigenvalue
		$X^{(P)}$		$Y^{(P)}$			
1	.944	.637	.498	.969	-.237	.942	.887
2	-.327	.766	-.798	-.246	.972	.612	.375

$X^{(P)}$ = Canonical X Variate
$Y^{(P)}$ = Canonical Y Variate

canonical variate thus appears to be representative of stress expectancy in general, and of the stress expectancy associated with engaging in counterstress activity in particular.

The structure coefficients associated with the first canonical Y variate ($\underline{Y}^{(1)}$) indicate that this variate had its highest correlation with the original Stress Arousal variable ($\underline{r}$ = .969), and that it had only a very weak association ($\underline{r}$ = -.237) with the original Coping Propensity variable. Thus, the first Y variate may, in general, be said to be representative of the construct of anticipatory stress arousal. Taking the first pair of canonical variates together, it may be stated that a linear composite dominated by the stress expectancy associated with counterstress activity, and to a lesser extent, by the stress expectancy associated with no counterstress activity, accounted for approximately 89% of the variance (see Table 2-11) in a linear composite dominated by anticipatory stress arousal. Such an association clearly is in accord with the choice/control model, which suggests that anticipatory stress arousal primarily will be a function of the smallest of the cost of coping Ratio components (in this case, the Numerator), and also, a function of such other stress-relevant factors as anticipated stress impact. Anticipated stress impact in the choice/control model is strongly represented in the Denominator of the cost of coping Ratio (i.e., in the stress expectancy associated with no counterstress activity).

Interpretation of the Second Canonical Variate Pair. An examination of the structure coefficients associated with the second canonical X variate ($\underline{X}^{(2)}$) indicate that this variate was strongly associated with both the original Ratio ($\underline{r}$ = -.798) and Denominator ($\underline{r}$ = .766) variables, and that it was only weakly associated with the original Numerator ($\underline{r}$ = -.327) variable. The structure coefficients associated with the second Y variate ($\underline{Y}^{(2)}$) indicate that it was very strongly associated with the original Coping Propensity variable ($\underline{r}$ = .972), and that it had only a very weak association with the original

Stress Arousal variable ($\underline{r}$ = -.246). Taking the second pair of canonical variates together, it may be stated that a linear composite dominated by the original Ratio and Denominator variables accounted for approximately 38% (see Table 2-11) of the variance in a linear composite dominated by the original Coping Propensity variable. Although the strong Ratio/Coping Propensity association clearly was expected given the tenets of the choice/control model, the almost equally strong Denominator/Coping Propensity association was not. At a preliminary level, this relationship suggests that the inclination to engage in counterharm activity also may be "driven by" the stress expectancy associated with not engaging in counterharm behaviour.

Redundancy Analysis. Because it was of interest to know how much variance the canonical variates from the set of independent variables (i.e., $X^{(1)}$, $X^{(2)}$) extracted from the set of dependent variables (SA, CP), and how much variance the canonical variates from the set of dependent variables (i.e., $Y^{(1)}$, $Y^{(2)}$) extracted from the set of independent variables (Numerator, Denominator, Ratio), a redundancy analysis (see Stewart & Love, 1968; Miller & Farr, 1971; Tabachnick & Fidell, 1989) was performed subsequent to the canonical correlation analysis. Computationally, redundancy may be defined as the percentage of variance a canonical variate extracts from its own set of variables, times the canonical correlation squared for the pair of canonical variates of interest (see Tabachnick & Fidell, 1989, p. 203). Results of this analysis indicated that together, the X variates extracted 62.4% (45.63% + 16.77%) of the variance in the Coping Propensity and Stress Arousal variables, and that together, the Y variates extracted 63.1% (44.29% + 18.81%) of the variance in the Numerator, Denominator, and Ratio variables. These indexes thus indicated that knowledge about the extracted X and Y variates yielded considerable information about the sets of dependent and independent variables, respectively.

Summary

Study One constituted an initial attempt to assess the tenability of the choice/control model using an imaginal, questionnaire format. In a series of preliminary analyses, it was determined: (a) that responses to questionnaires were based on the content of items, and not on irrelevant, item endorsing strategies; (b) that item endorsements were not influenced by the order of questionnaire presentation; and (c) that item endorsements tended to be highly stable across a two-week, test-retest period. In addition, it was established, at both the theoretical and empirical levels, that the 46 situation/coping option pairs (versus the 156 experimental subjects) constituted appropriate units of analysis.

In general, Study One yielded strong support for the validity of the choice/control model. In preliminary correlational analyses, it was determined that, as predicted, Coping Propensity was inversely related to the cost of coping Ratio, and also, that Stress Arousal was most strongly associated with the smallest of the cost of coping Ratio components (i.e., the Numerator). The interpretive validity of these associations was further enhanced by the finding that all hypothesis-relevant correlations differed significantly from potentially competing counterparts, and by the finding that in three out of four contrasts undertaken, the magnitudes of the hypothesis-relevant correlations differed significantly from the magnitudes of potentially competing counterparts. Although it could not be concluded that the variance of the Ratio variable was linearly explained by the Coping Propensity variable to any greater degree than it was by the Stress Arousal variable, interpretive difficulties were offset to a certain degree by the fact that the two sets of correlations involved originally were in different, logically predicted directions, and by the fact that in their signed forms, these correlations also were significantly different.

Lastly, as a final testament to the strength of the revealed associations, it was determined that a linear composite dominated by the stress expectancy associated with counterstress activity accounted for approximately 89% of the variance in a linear composite dominated by anticipatory stress arousal, and, that a linear composite dominated by the original Ratio and Denominator variables accounted for approximately 38% of the variance in a linear composite dominated by the original Coping Propensity variable. The first canonical association provided additional support for the hypothesis that stress arousal primarily would be associated with the smallest of the cost of coping Ratio components, while the second canonical association provided further support for the hypothesis that Coping Propensity would be inversely related to the cost of coping Ratio. In a manner that was somewhat unpredicted, the latter canonical association also suggested that the inclination to engage in counterharm activity may be strongly "driven" by the stress expectancy associated with not engaging in counterharm behaviour. Because this finding emerged in the context of a very specific type of research study, however, its meaning and replicability should be considered tentative, pending its further assessment in alternative experimental contexts.

CHAPTER 3. STUDY TWO

Although the results of Study One clearly supported certain predicted relationships among the various model-relevant variables, they did not illuminate the extent to which endorsements in each of the 46 stressful situations conformed to model-congruent patterns of behaviour. Such an assessment was deemed important for at least two reasons. First, the Study One correlational analyses were conducted across the 46 stressful situations. Thus, it is possible that certain model-relevant relationships, characteristic of only certain subsets of situations, were obscured by this level of analysis. Second, as was stated previously, the choice/control model purportedly represents a "universal" model of coping behaviour. That is, it purportedly represents cognitive/decisional processes that are operative across all individuals and across all types of stressful situations. Thus, the way in which model-relevant components act to dictate coping propensity and stress arousal should remain relatively invariant across different situations. That is, "cost of coping ratios", no matter how or where they are generated, should be inversely related to levels of coping propensity. Furthermore, levels of anticipatory stress arousal should be influenced primarily by the lowest of the Numerator or Denominator ratio components. However, as the Ratio increases, and the discrepancy between the Numerator and Denominator decreases, Stress Arousal should increase due to decisional conflict.

The goal of Study Two was to determine the profiles of model-relevant variables that characterized each of the 46 stressful situations. It was hypothesized that support for the choice/control model would be engendered to the extent that the 46 stressful situations exhibited "model-congruent" profiles of variable ratings. Because the choice/control model purports to represent "universal" cognitive/decisional processes influencing inclinations to engage in active counterharm activity, it was predicted that one or more model-congruent profiles would characterize all 46 stressful situations from the CR, CP, and SA questionnaires. Analyses were conducted using the data from Study One and the method of Modal Profile Analysis (Skinner, 1977, 1978). Below, an overview of the technique of Modal Profile Analysis is presented, in addition to a rationale for its selection in this study.

Overview of Modal Profile Analysis

As was stated above, the goal of Study Two was to classify the 46 stressful situations according to the similarity of their profile patterns of model-relevant variables. Although any number of clustering strategies could have been chosen for this classification procedure, Modal Profile Analysis (MPA; Skinner, 1977, 1978) was chosen for at least four reasons. First, unlike many other classification strategies, Modal Profile Analysis systematically considers both internal and external validation of the identified types. Second, it attempts to incorporate the advantages of two classification strategies, namely, ordination and clustering approaches. Third, it makes the distinction between systematic and error variance that is crucial to the derivation of population types. Fourth, it allows one to evaluate the independent contributions of the profile components of elevation, scatter, and shape (e.g., see Skinner, 1977, 1978).

Conceptually, Modal Profile Analysis is based on the concept of a Modal Profile, which formally may be defined as "a hypothetical profile pattern characteristic of frequently occurring entities in the population" (Skinner, 1975, p. 52). Within the methodological framework of Modal Profile Analysis, it is hypothesized that in any given population, a number of "pure" profile patterns exist. It further is hypothesized that each population member relates most closely to only one of these profile types. Like factors in factor analysis, Modal Profiles are conceived of as representing reliable covariation among entities (Skinner, 1977).

From a computational point of view, Modal Profile Analysis conveniently may be separated into three distinguishable stages. These include: (i) the derivation of preliminary profile types within each of m different samples; (ii) replication of the derived preliminary profiles across samples; and (iii) assessment of the generalizability of the derived Modal Profiles. Each of these stages will be discussed in turn with reference to the data of the present study.

Stage 1: Derivation of the Preliminary, Within-Sample Profiles. Stage 1 of Modal Profile Analysis begins with an input data matrix **X**, representing the observations of N entities on k attributes. In the usual case of Modal Profile Analysis, the N entities represent N subjects, or groups of subjects, and the attributes represent a given set of variable measures (e.g., scores on various MMPI scales, etc.). In the present study, however, the entities were the 46 stressful situations used on the CR, CP, and SA questionnaires. The attributes of interest included the five model-relevant variables (i.e., the Numerator, Denominator, Coping Propensity, Stress Arousal, and Ratio variables) representative of the dimensions of the choice/control model.

Typically, in Stage 1 of Modal Profile Analysis, matrix **X** is partitioned by row into m samples of size n_j each. However, because the present study required two samples of the same 46 items, the partitioning proceeded as follows. First, the original sample of 156 subjects was divided into two random samples of 78. Mean values of the 46 stressful situations on the five model-relevant variables then were calculated by collapsing across these samples. Thus, the first stage of the analysis began with two 46 x 5, Item x Variable matrices.

In the next phase of Modal Profile analysis, a singular value decomposition (Stewart, 1973) is performed on each of the m input submatrices. Conceptually, this is analogous to performing a principal components analysis on the transpose of the input data matrices. During the process of decomposition, each matrix is scaled to remove elevation and scatter parameters, so that these profile components independently can be retained (Skinner, 1977; Skinner & Lei, 1980). Briefly, this is accomplished by rescaling the elements of **X** via both row and column standardization (e.g., see Skinner, 1975). Vectors of elevation and scatter parameters extracted through this rescaling procedure then are retained for possible future analyses.

The unrotated item factor matrices resulting from the singular value decompositions of the Study Two data sets are presented in Tables 3-1 and 3-2. Loadings are presented for the first four factors only, as the remaining factors each had eigenvalues of zero. Loadings in these factor matrices describe the weightings of the 46 items on item factors in the entity factor space. Eigenvalues, depicting the relative importance of each factor, are printed at the bottom of each item factor matrix. In both factor matrices, two large eigenvalues are followed by two of lesser magnitude, and then by eigenvalues of zero for the remaining factors. Tentatively, this suggested the retention of two factors within each set for rotation to simple structure.

In order to determine the number of dimensions to retain and interpret within each set more decisively, a criterion specific to the Modal Profile Analysis program was adopted. As per Skinner and Lei (1980), this criterion was based on the number of eigenvalues exceeding one when a principal components analysis was conducted on the <u>variables</u>. Computationally, the criterion is calculated by rescaling each of the original principal components eigenvalues (i.e., see Tables 3-1 and 3-2) by a factor of <u>NC</u>(variables)/<u>NR</u>(entities). Then, the "eigenvalues greater than one" criterion is applied to the rescaled eigenvalues, which now sum to the total number of variables (Skinner & Lei, 1980, p. 15).

The rescaled eigenvalues for the two data samples are outlined in Table 3-3. As is indicated, the internal criterion resulted in the retention of the first two factors in each of the two subsets of data. Together, these two factors accounted for 87 and 88 percent of the variance in the two data samples, respectively.

In the next phase of the analysis, the extracted entity factors are subjected to univocal varimax rotations (Jackson & Skinner, 1975).

Table 3-1

Unrotated Item Factor Matrix - MPA Stage I - Sample 1

	I	II	III	IV
1	-0.795	-0.509	-0.166	-0.284
2	-0.985	-0.127	-0.040	-0.113
3	0.376	-0.840	-0.385	-0.065
4	0.374	0.889	0.254	-0.074
5	-0.946	0.210	-0.143	0.200
6	0.151	0.904	0.333	0.222
7	-0.839	0.532	0.033	-0.114
8	-0.077	-0.175	0.977	0.100
9	0.928	-0.112	0.326	0.143
10	0.922	-0.221	-0.005	-0.317
11	0.370	0.526	-0.614	-0.458
12	-0.840	-0.366	0.029	0.400
13	-0.300	-0.927	0.024	-0.222
14	0.068	-0.953	0.287	-0.076
15	-0.957	0.201	-0.068	0.198
16	-0.973	0.097	0.146	0.152
17	0.885	-0.122	0.253	0.370
18	-0.991	0.072	-0.002	0.115
19	0.992	-0.048	-0.070	0.098
20	0.759	-0.579	-0.233	0.183
21	-0.099	0.966	0.101	-0.218
22	0.391	0.864	-0.292	0.123
23	0.634	0.763	0.123	0.014
24	0.868	0.395	-0.149	0.261
25	-0.982	0.000	-0.035	-0.188
26	-0.838	0.471	-0.014	0.275
27	0.902	0.391	0.111	-0.143
28	-0.902	0.389	-0.134	0.131
29	0.953	-0.207	0.216	0.047
30	-0.612	-0.782	0.023	0.114
31	0.767	-0.609	-0.197	0.037
32	0.827	-0.272	0.480	-0.106
33	-0.978	-0.135	0.141	-0.070
34	-0.476	0.005	0.867	-0.151
35	0.602	-0.507	0.617	0.003
36	-0.821	-0.534	-0.033	-0.200
37	0.180	-0.970	-0.137	-0.087
38	-0.541	-0.833	-0.052	-0.100
39	-0.846	-0.449	0.240	-0.161
40	0.890	0.165	-0.380	-0.190
41	0.984	-0.099	-0.086	-0.116
42	-0.896	0.386	0.148	-0.165
43	-0.892	0.438	-0.102	-0.042
44	0.679	-0.725	-0.019	0.114
45	0.179	0.564	0.448	-0.670
46	-0.900	-0.433	-0.058	-0.007
Eigenvalues	26.435	13.443	4.147	1.976

Table 3-2

Unrotated Item Factor Matrix - MPA Stage I - Sample 2

	I	II	III	IV
1	-0.781	-0.333	0.222	-0.479
2	-0.994	0.033	0.044	-0.094
3	0.846	-0.364	0.331	-0.206
4	-0.056	0.967	-0.233	-0.082
5	-0.973	0.037	0.055	0.223
6	0.818	0.572	-0.058	-0.031
7	-0.766	0.600	0.200	-0.115
8	0.451	0.500	-0.708	0.212
9	0.623	0.712	-0.270	0.181
10	0.940	-0.068	-0.027	-0.332
11	-0.473	0.630	0.605	0.111
12	-0.680	-0.340	-0.564	0.323
13	-0.495	-0.818	-0.210	-0.204
14	-0.198	-0.785	-0.318	0.493
15	-0.956	0.192	-0.007	0.219
16	-0.931	0.251	-0.265	0.006
17	0.969	-0.056	-0.231	-0.071
18	-0.928	0.323	-0.122	0.137
19	0.937	-0.308	0.027	0.164
20	0.662	-0.737	-0.059	0.127
21	-0.900	-0.003	-0.211	0.380
22	-0.380	0.859	0.342	-0.034
23	0.592	0.805	0.051	0.002
24	0.982	-0.038	-0.040	-0.178
25	-0.789	0.402	-0.140	-0.443
26	-0.962	0.202	0.115	0.146
27	0.924	0.365	0.100	-0.048
28	-0.976	0.140	0.140	0.090
29	0.970	-0.016	-0.073	0.231
30	-0.533	-0.732	-0.047	-0.422
31	0.846	-0.497	0.164	0.096
32	0.765	-0.536	-0.256	-0.250
33	-0.890	-0.226	0.080	-0.387
34	-0.036	0.729	-0.598	-0.332
35	0.631	0.204	-0.684	-0.304
36	-0.897	-0.244	-0.116	-0.349
37	0.048	-0.992	0.046	-0.104
38	-0.493	-0.866	-0.061	-0.059
39	-0.899	-0.085	-0.339	-0.264
40	0.751	-0.655	0.075	0.036
41	0.968	-0.095	0.216	0.078
42	-0.773	-0.631	0.046	0.053
43	-0.970	-0.051	0.037	0.234
44	0.956	-0.273	0.105	0.024
45	0.305	0.924	0.118	-0.197
46	-0.934	-0.336	-0.110	0.049
Eigenvalues	27.984	12.391	3.195	2.431

Table 3-?

Principal Components Eigenvalues Rescaled by a Factor of NC/NR[a]

	I	II	III	IV
Sample 1 Eigenvalues	2.87	1.46	.45	.22
Sample 2 Eigenvalues	3.04	1.35	.35	.26

[a] NC/NR = 5/46 = .1087

These rotations attempt to improve upon the simple structure qualities of varimax solutions by attempting to have each entity load maximally on only one factor. The rotated factor matrices for Samples 1 and 2 are presented in Tables 3-4 and 3-5. The item factors in these matrices may be conceived of as hypothetical "types" representative of items with salient loadings upon them.

In the present study, it was determined that an item had to have a loading of |.50| or greater in order to be considered as having a salient weighting on a given item factor (e.g., see Skinner & Lei, 1980). In each of the two samples, this resulted in sets of principal components models which exhibited excellent fits to the data. Goodness of fit was supported initially by the classification efficiencies achieved by each set of principal components models. Classification efficiencies may be defined as the percentages of items that are salient on derived entity factors or types (Skinner & Lei, 1980). Referring to Table 3-6, it can be seen that 44 Sample 1 items had salient loadings on either Type I or Type II. This translated into a classification efficiency of 95.65%, indicating an excellent fit of the principal components models to the data. Table 3-7 similarly indicates that all 46 Sample 2 items had salient loadings on either Type I or Type II. This yielded a classification efficiency of 100%, and again, supported the fit of the models to the data. As stated above, the two factors retained within each sample also explained extremely high proportions of the total variance (i.e., 87% in Sample 1 and 88% in Sample 2). These proportions of variance served as a second indication of the goodness of fit of the principal components models.

In the final phase of Stage 1 , factor scores are generated for each attribute variable from the univocal varimax rotated factor matrices. Thus, in the case of the present study, factor scores were generated for the five model-relevant variables representing the dimensions of the choice/control model. In each of Samples 1 and 2, this yielded two vectors of rotated factor scores, corresponding to two

Table 3-4

Sample 1 Univocal Varimax Rotated Factor Matrix

	I	II
1	0.617	-0.715
2	0.907	-0.403
3	-0.600	-0.698
4	-0.105	0.959
5	0.967	-0.069
6	0.113	0.909
7	0.955	0.271
8	0.024	-0.190
9	-0.921	0.157
10	-0.947	0.052
11	-0.204	0.609
12	0.701	-0.590
13	0.023	-0.974
14	-0.336	-0.894
15	0.975	-0.080
16	0.960	-0.184
17	-0.884	0.135
18	0.970	-0.213
19	-0.964	0.236
20	-0.893	-0.339
21	0.370	0.897
22	-0.128	0.940
23	-0.390	0.912
24	-0.719	0.626
25	0.941	-0.280
26	0.938	0.212
27	-0.754	0.632
28	0.976	0.115
29	-0.972	0.073
30	0.364	-0.924
31	-0.909	-0.365
32	-0.870	-0.025
33	0.899	-0.408
34	0.457	-0.131
35	-0.721	-0.314
36	0.635	-0.746
37	-0.449	-0.879
38	0.281	-0.953
39	0.683	-0.671
40	-0.806	0.412
41	-0.972	0.185
42	0.968	0.114
43	0.980	0.166
44	-0.857	-0.502
45	-0.010	0.592
46	0.739	-0.671
Eigenvalues	25.377	14.498

Table 3-5

Sample 2 Univocal Varimax Rotated Factor Matrix

	I	II
1	0.654	-0.542
2	0.962	-0.252
3	-0.914	-0.107
4	0.330	0.911
5	0.943	-0.241
6	-0.621	0.781
7	0.905	0.357
8	-0.289	0.608
9	-0.394	0.860
10	-0.921	0.203
11	0.633	0.469
12	0.555	-0.520
13	0.241	-0.925
14	-0.034	-0.809
15	0.972	-0.089
16	0.964	-0.025
17	-0.944	0.223
18	0.982	0.045
19	-0.986	-0.028
20	-0.844	-0.517
21	0.862	-0.259
22	0.609	0.714
23	-0.338	0.940
24	-0.952	0.244
25	0.871	0.160
26	0.979	-0.081
27	-0.782	0.614
28	0.975	-0.144
29	-0.934	0.262
30	0.302	-0.8[illegible]3
31	-0.953	-0.235
32	-0.886	-0.295
33	0.789	-0.471
34	0.242	0.688
35	-0.547	0.375
36	0.790	-0.490
37	-0.329	-0.937
38	0.225	-0.971
39	0.838	-0.338
40	-0.907	-0.414
41	-0.955	0.185
42	0.561	-0.825
43	0.916	-0.325
44	-0.994	0.011
45	-0.029	0.973
46	0.800	-0.588
Eigenvalues	26.714	13.657

Table 3-6

Stage 1 Classification Analysis - Sample 1

Items Classified According to Type I		Items Classified According to Type II	
Item	Loading	Item	Loading
2	0.91	1	-0.71
5	0.97	3	-0.70
7	0.96	4	0.96
9	-0.92	6	0.91
10	-0.95	11	0.61
12	0.70	13	-0.97
15	0.97	14	-0.89
16	0.96	21	0.90
17	-0.88	22	0.94
18	0.97	23	0.91
19	-0.96	30	-0.92
20	-0.89	36	-0.75
24	-0.72	37	-0.88
25	0.94	38	-0.95
26	0.94	45	0.59
27	-0.75		
28	0.98	Positive Pole: 7	
29	-0.97	Negative Pole: 8	
31	-0.91	Total: 15	
32	-0.87		
33	0.90		
35	-0.72		
39	0.68		
40	-0.81		
41	-0.97		
42	0.97		
43	0.98		
44	-0.86		
46	0.74		
Positive Pole: 15			
Negative Pole: 14			
Total: 29			

Number of Items Classified with Loading Criterion |.50|: 44
Classification Efficiency = 95.65%
Total Percentage of Variance Explained = 86.69

Table 3-7

Stage 1 Classification Analysis - Sample 2

Items Classified According to Type I

Item	Loading
1	0.65
2	0.96
3	-0.91
5	0.94
7	0.91
10	-0.92
11	0.63
12	0.55
15	0.97
16	0.96
17	-0.94
18	0.98
19	-0.99
20	-0.84
21	0.86
24	-0.95
25	0.87
26	0.98
27	-0.78
28	0.98
29	-0.93
31	-0.95
32	-0.89
33	0.79
35	-0.55
36	0.79
39	0.84
40	-0.91
41	-0.96
43	0.92
44	-0.99
46	0.80

Positive Pole: 18
Negative Pole: 14
Total: 32

Items Classified According to Type II

Item	Loading
4	0.91
6	0.78
8	0.61
9	0.86
13	-0.93
14	-0.81
22	0.71
23	0.94
30	-0.85
34	0.69
37	-0.94
38	-0.97
42	-0.83
45	0.97

Positive Pole: 8
Negative Pole: 6
Total: 14

Number of Items Classified with Loading Criterion |.50|: 46
Classification Efficiency = 100.00%
Total Percentage of Variance Explained: 87.77

sets of preliminary Modal Profiles. These profiles of rotated factor scores, shown in their *T*-score forms (e.g., see Skinner, 1977) are outlined in Table 3-8. In addition, graphic representations of each of the preliminary profiles are shown in Figures 3-1 through 3-4.

Stage 2: Replication of Preliminary Profiles Across Samples. After having derived the preliminary attribute profiles from each of the *m* subsets of data, the initial goal of Stage 2 of Modal Profile Analysis is to evaluate the degree of congruence between the preliminary attribute profiles extracted from the *m* samples of data. The rationale behind this procedure is that the veridicality of the preliminary profiles will be supported in part, by their replicability across samples. The input for this stage of analysis is the multisample Profile x Variable factor score matrix generated in the final phase of MPA Stage 1 (e.g., see Table 3-8).

The coefficients of congruence between the within- and across-sample profiles are depicted in the multiprofile-multisample matrix in Table 3-9. As can be seen from this matrix, similar profiles from Samples 1 and 2 exhibited near perfect degrees of congruence. Thus, clearly it could be stated that the preliminary profiles exhibited high degrees of replicability across the two random samples of data. It additionally could be stated that the two sets of dissimilar preliminary profiles exhibited desired low degrees of congruence.

The next stage of Modal Profile Analysis is devoted to transforming the preliminary attribute profiles into a single *k* x *i* "best fitting" factor score matrix. Computationally, this is accomplished by performing the Stage 1 dimensional analyses on the Stage 2 input Profile x Variable factor score matrix (e.g., see Skinner, 1977, 1978). The "best fitting" single matrix resulting from this procedure contained two vectors of rotated factor scores. These factor scores, shown in *T*-score form in Table 3-10, may be conceived of as estimates of the population Modal Profiles underlying the original two samples.

Table 3-8

Preliminary Attribute Profiles Derived from Stage 1 of Modal Profile Analysis

	Numerator [E(S)¦CA]	Denominator [E(S)¦NCA]	Coping Propensity	Stress Arousal	Ratio
Sample 1					
Profile 1	42	56	67	42	43
Profile 2	47	39	56	42	67
Sample 2					
Profile 1	42	54	68	43	43
Profile 2	50	35	56	44	64

Note: Factor scores are presented in T-score form (M = 50, SD = 10)

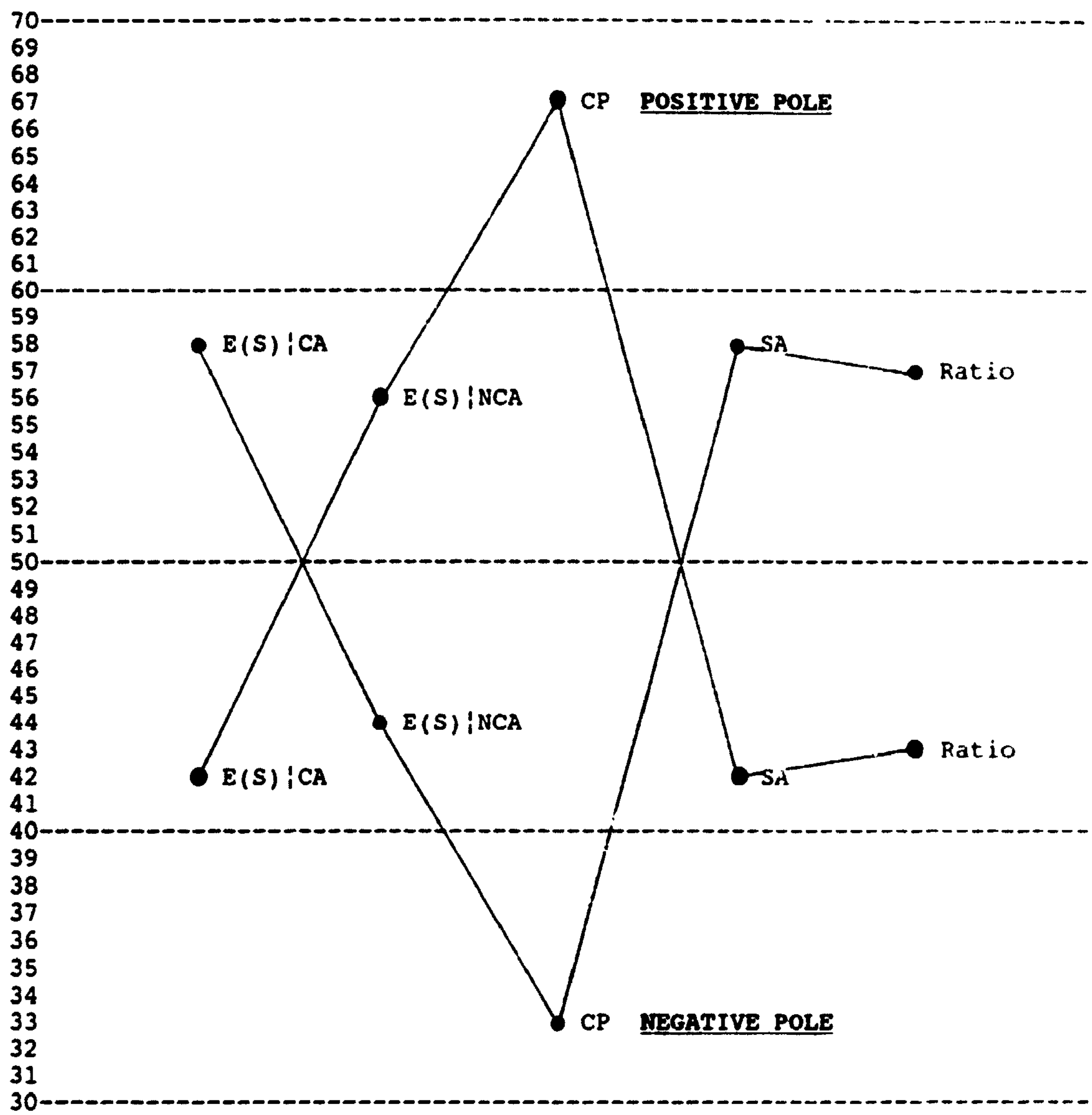


Figure 3-1. Graphic representation of positive and negative poles of preliminary modal profile I - Sample 1.

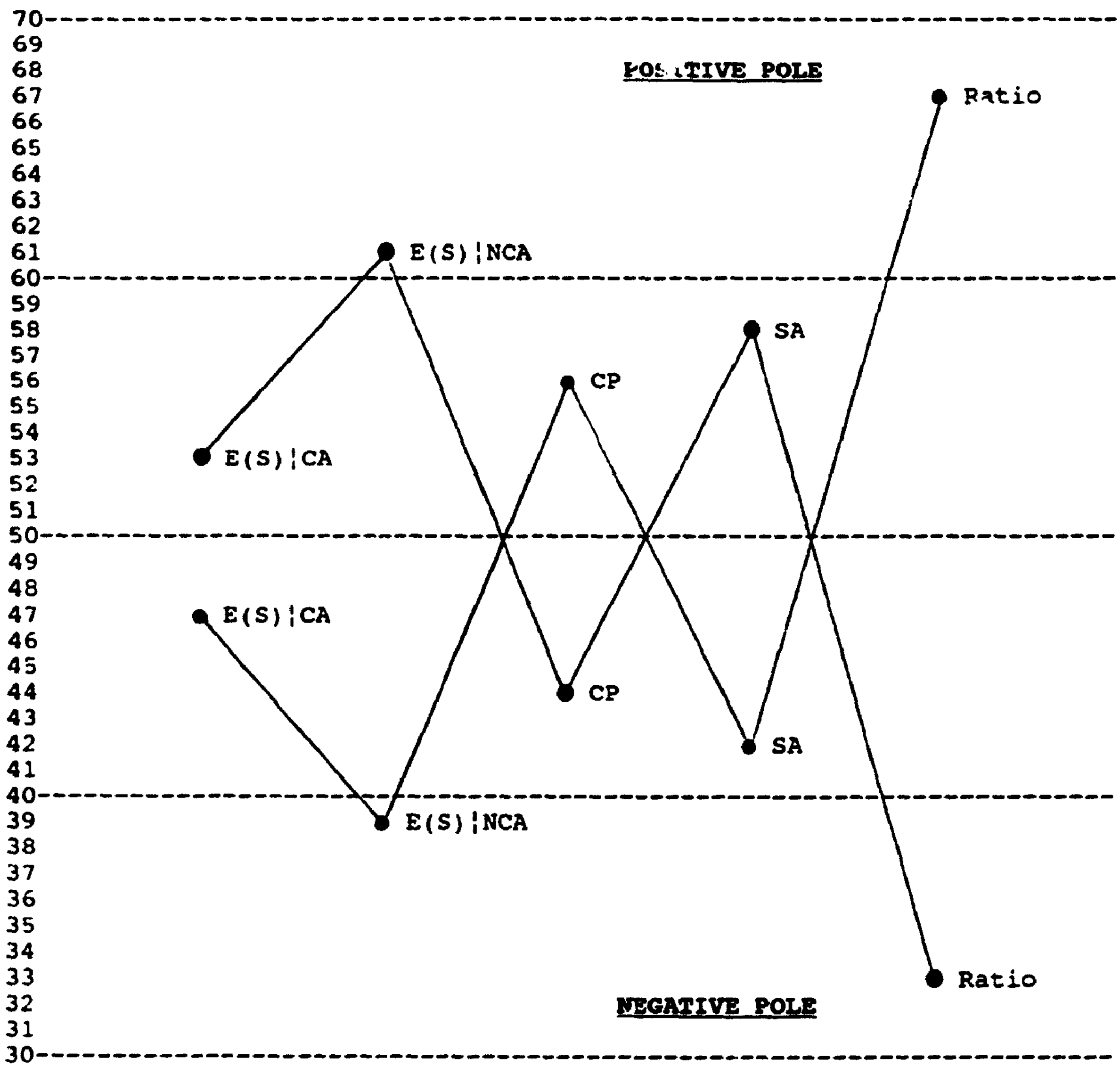


Figure 3-2. Graphic representation of positive and negative poles of preliminary modal profile II - Sample 1.

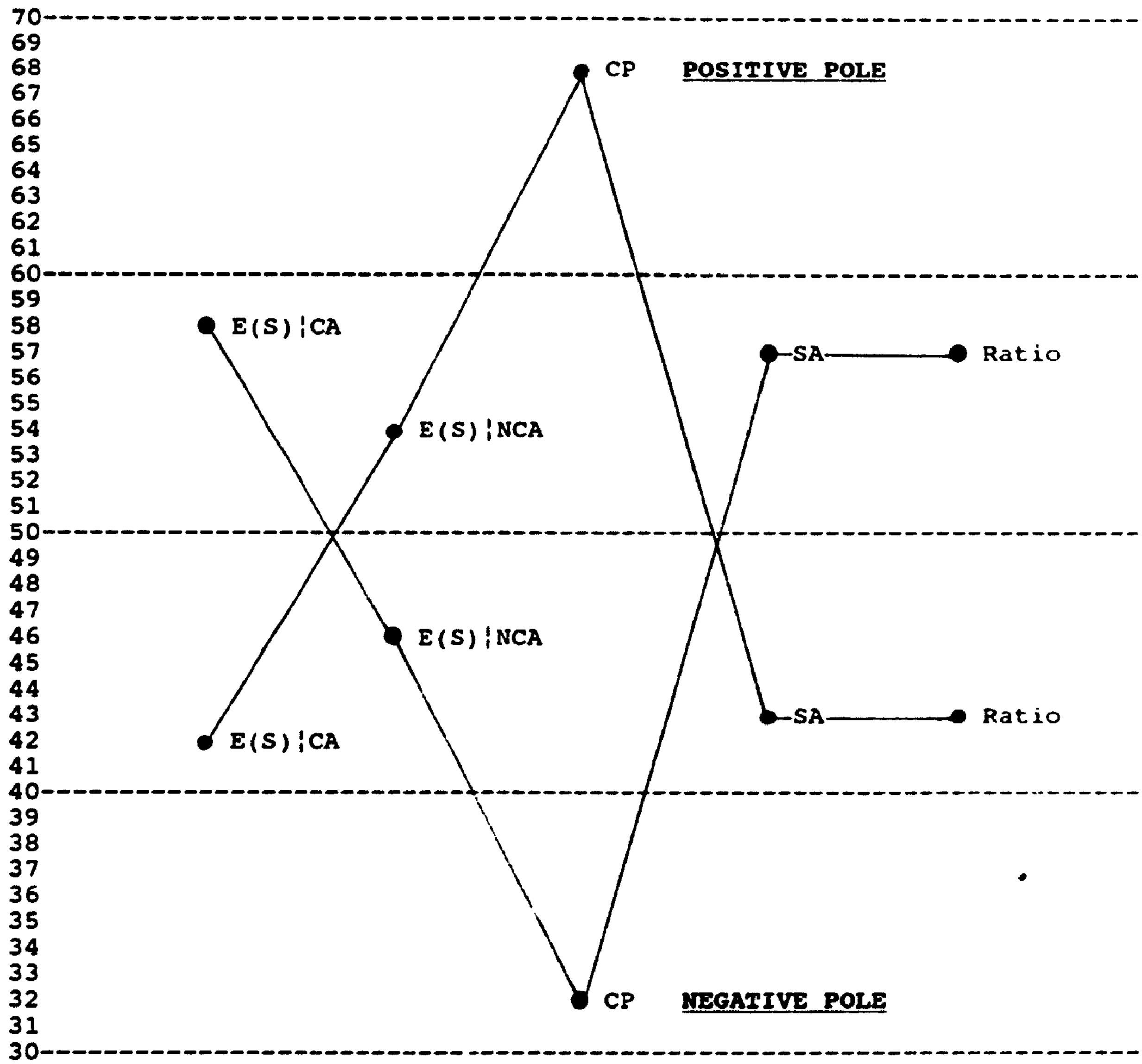


Figure 3-3. Graphic representation of positive and negative poles of preliminary modal profile I - Sample 2.

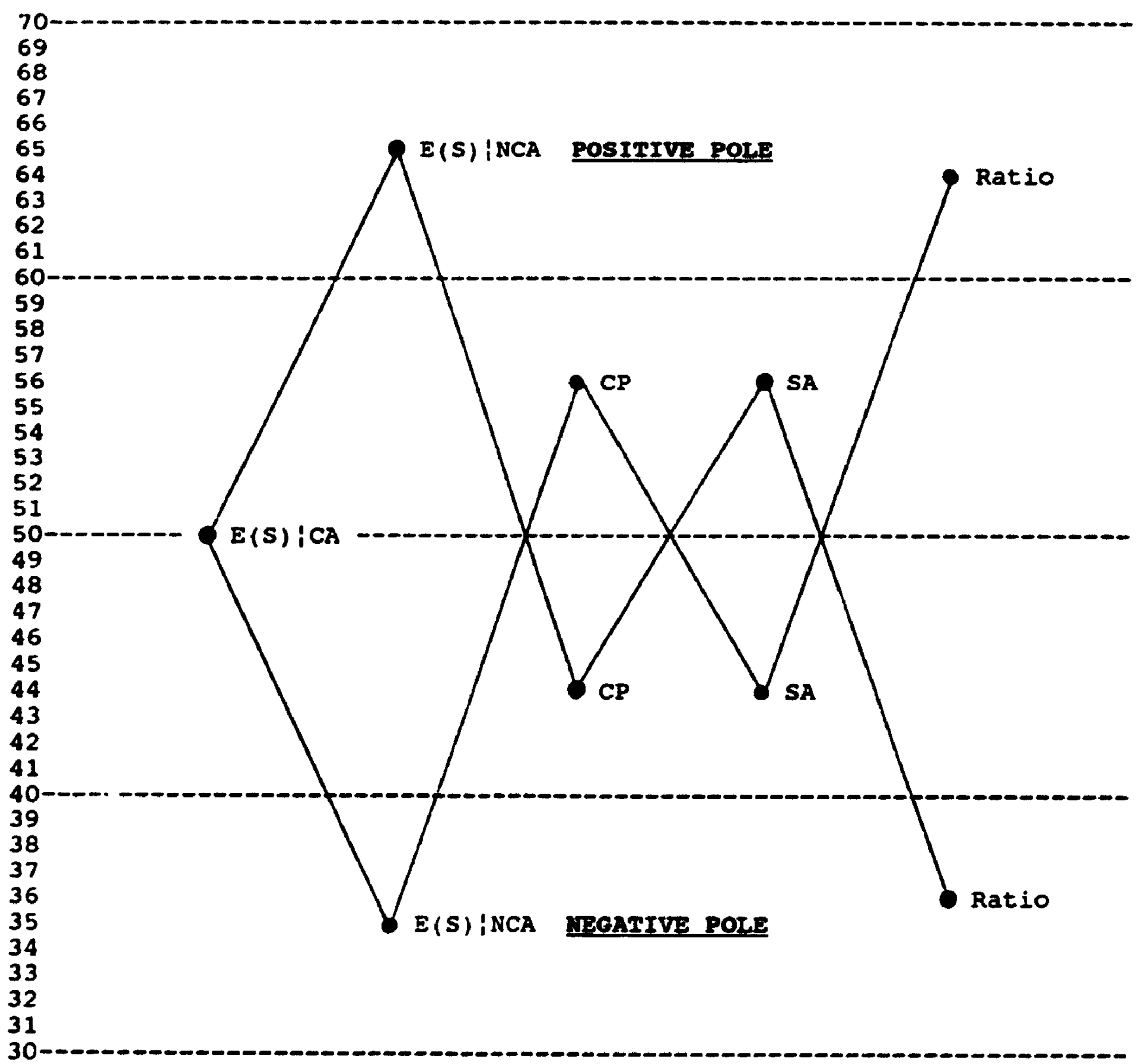


Figure 3-4. Graphic representation of positive and negative poles of preliminary modal profile II - Sample 2.

Table 3-9

Coefficients of Congruence Between Within- and Across-Samples Preliminary Modal Profiles

	P1S1	P2S1	P1S2	P2S2
P1S1	1.000	0.000	0.997	-0.052
P2S1	0.000	1.000	0.038	0.968
P1S2	0.997	0.038	1.000	0.000
P2S2	-0.052	0.968	0.000	1.000

Note: P1S1 = Preliminary Profile 1, Sample 1
P2S1 = Preliminary Profile 2, Sample 1
P1S2 = Preliminary Profile 1, Sample 2
P2S2 = Preliminary Profile 2, Sample 2

Table 3-10

Final Modal Profiles Derived From Stage 2 of Modal Profile Analysis

	Numerator [E(S)¦CA]	Denominator [E(S)¦NCA]	Coping Propensity	Stress Arousal	Ratio
Profile 1	42	55	68	42	43
Profile 2	48	37	56	43	66

Note: Factor scores are presented in T-score form (*M* = 50, *SD* = 10)

The Table 3-10 vectors of attribute factor scores represent the profiles of items loading at the positive poles of Types I and II, respectively. Items loading at the negative poles of these Types are characterized by vectors of factor scores that are the direct "inverses" of those outlined in Table 3-10 (e.g., see Skinner, 1977, 1978). For clarity of presentation, the positive and negative versions of Modal Profile I will be referred to as MPI+ and MPI-, respectively. Similarly, the positive and negative versions of Modal Profile II will be referred to as MPII+ and MPII-, respectively. Graphic representations of the positive and negative versions of Modal Profiles I and II are presented in Figures 3-5 through 3-8, respectively.

Stage 3: Assessment of the Generalizability of the Modal Profiles. The goal of the third stage of Modal Profile Analysis is to evaluate the degree to which the derived Modal Profiles are representative of the entities in the original *m* samples. Computationally, this is accomplished by classifying the entities from the original *m* samples using the final Modal Profiles from Stage 2. As is the case in Stage 1, an entity/Modal Profile correlation has to reach a classification criterion of $|.50|$ or greater. Upon meeting this criterion, an item is assigned to the final Modal Profile with which it has the highest absolute strength of association. The Stage 3 classification results for the data from Samples 1 and 2 are outlined in Tables 3-11 and 3-12.

In Sample 1, the two Modal Profiles classified 44 out of 46 stressful situations, yielding a classification efficiency of 96.65%. In addition, the total variance explained by the Modal Profiles in Sample 1 was 86.35%. In Sample 2, the Modal Profiles classified all 46 situations, yielding a classification efficiency of 100%. The total variance explained by the profiles in Sample 2 was 87.43%. In addition, in the two samples of data, 36 out of 46 stressful situations (78%) loaded onto identical Modal Profiles. These 36 situations, outlined in

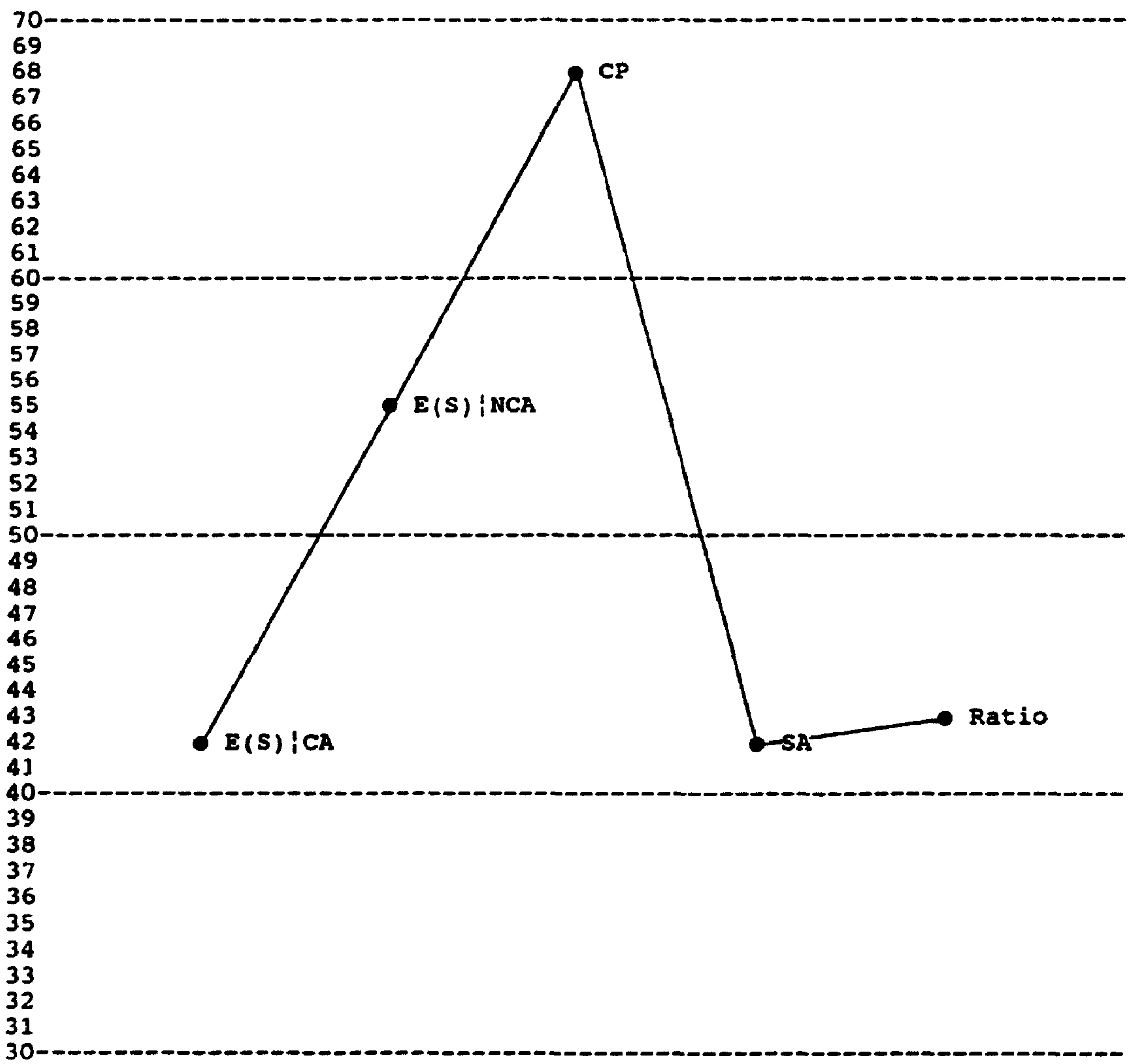


Figure 3-5. Graphic representation of MPI+.

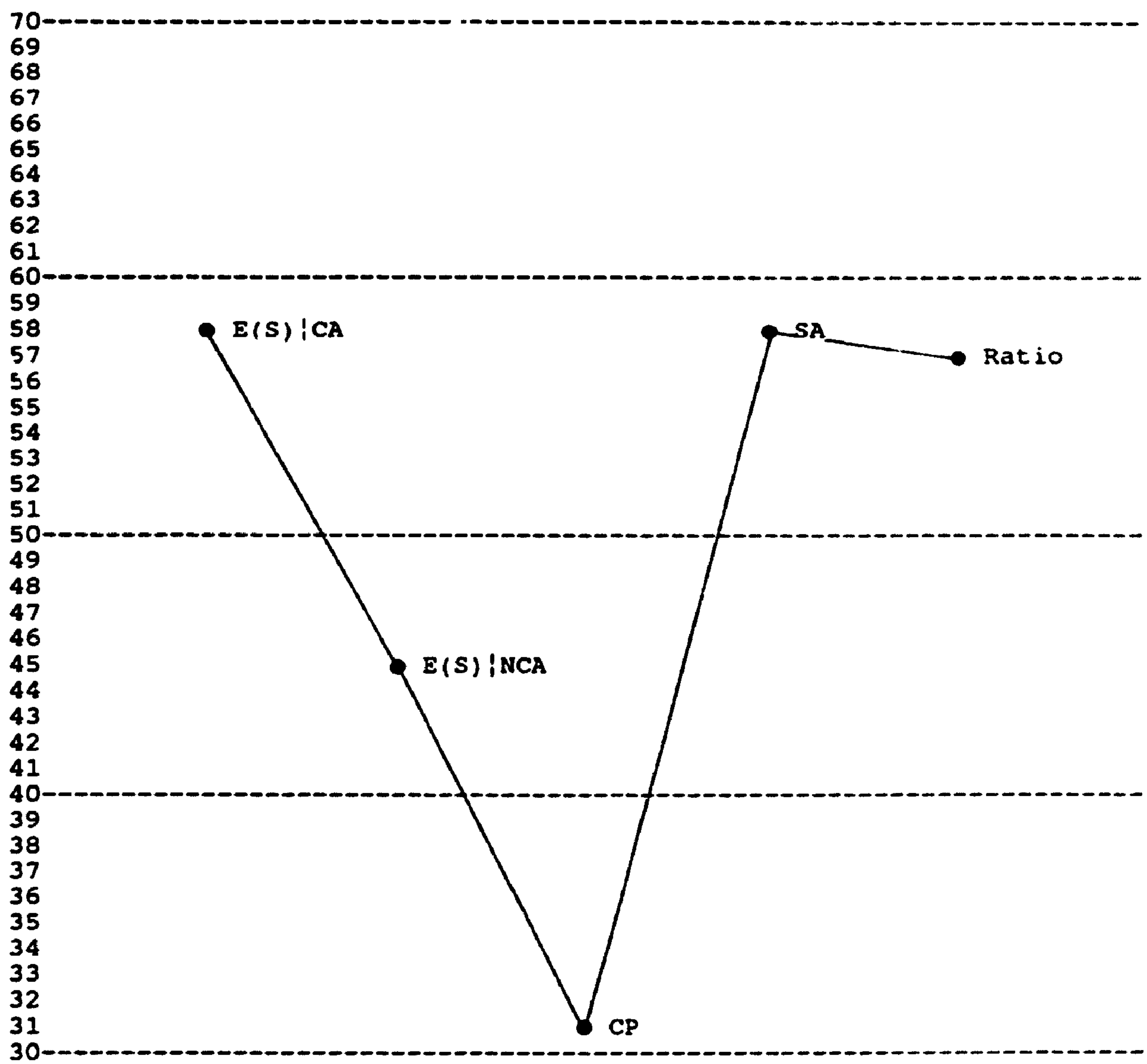


Figure 3-6. Graphic representation of MPI-.

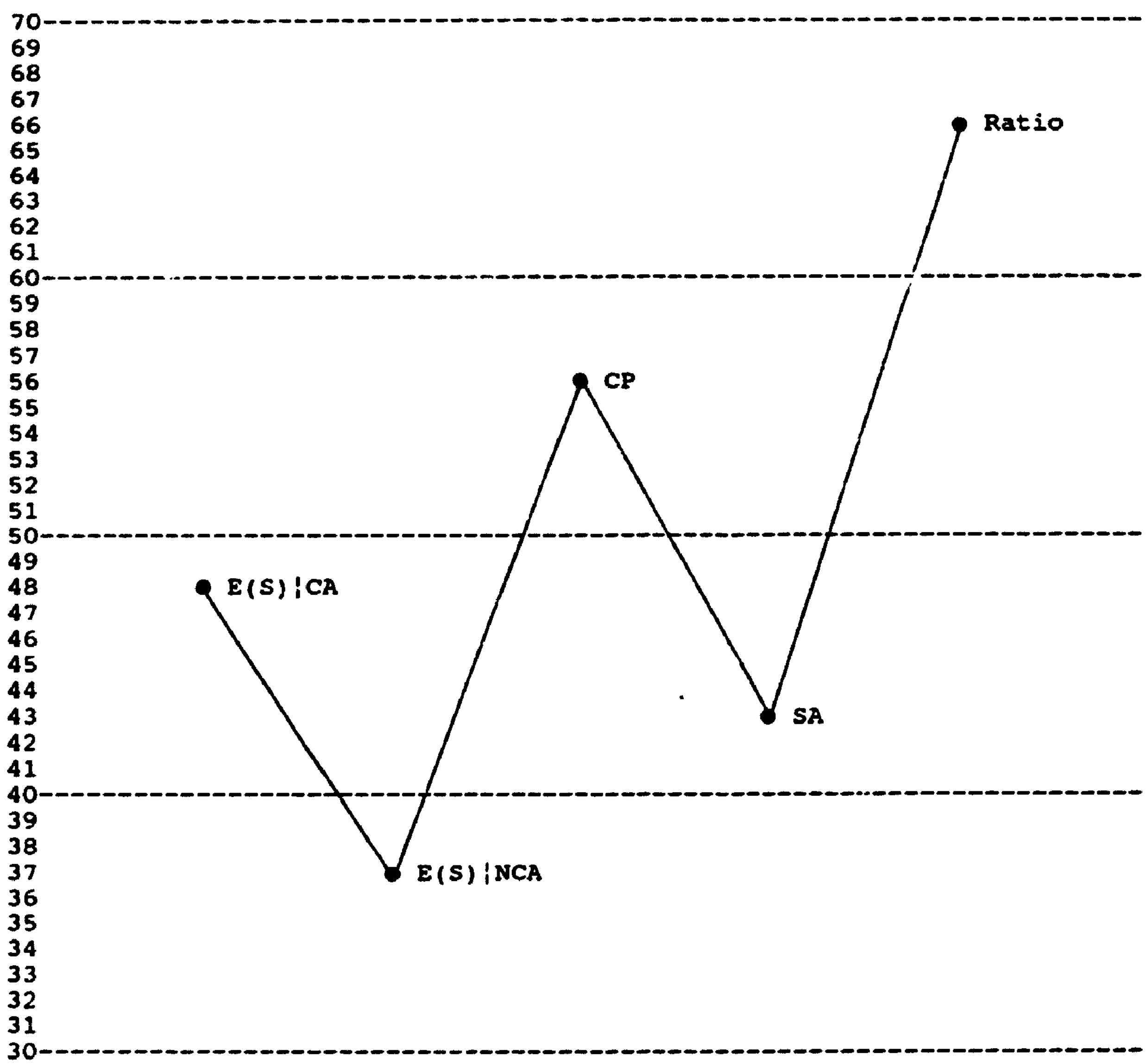


Figure 3-7. Graphic representation of MPII+.

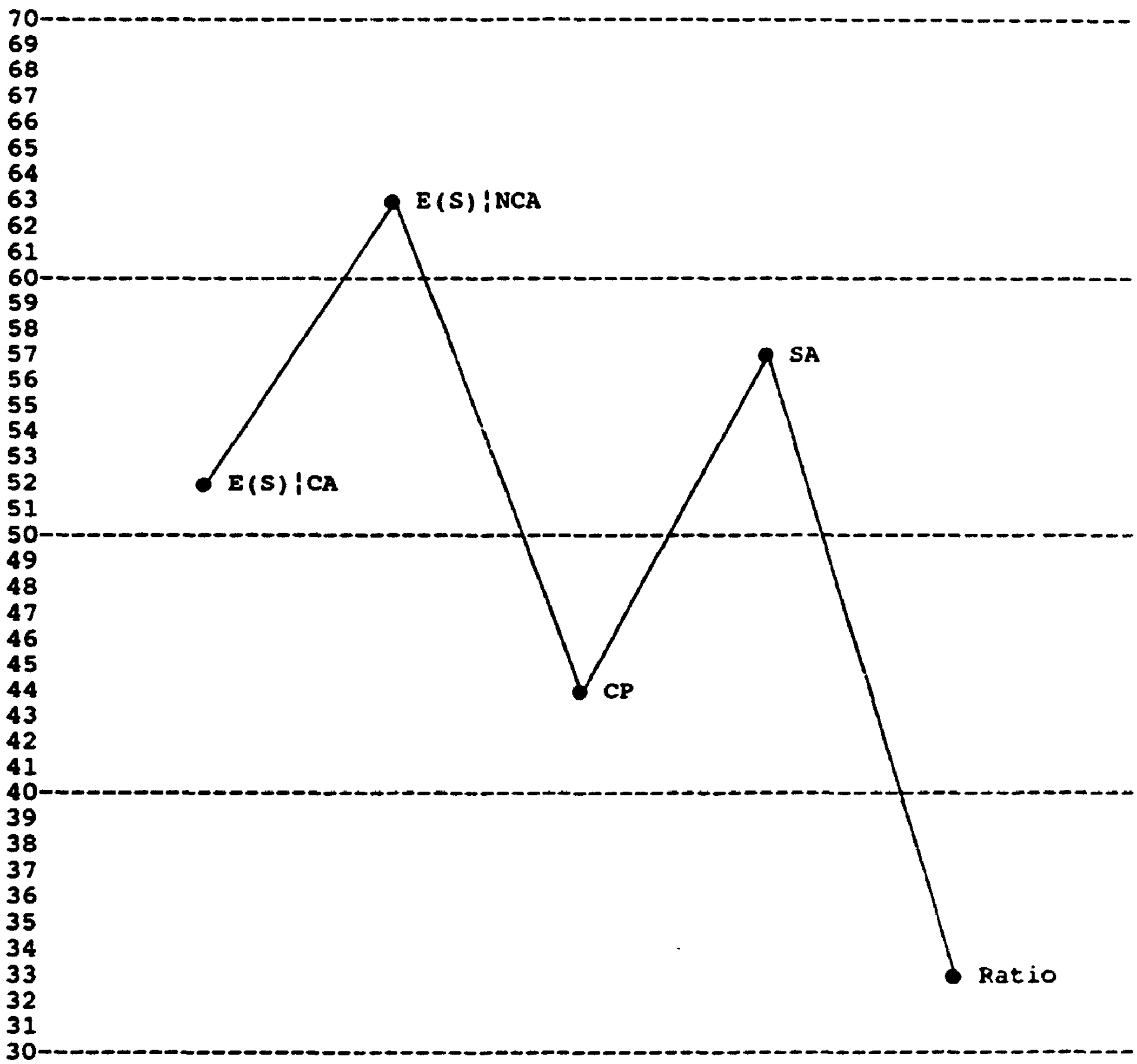


Figure 3-8. Graphic representation of MPII-.

Table 3-11

Stage 3 Classification Analysis - Sample 1

Items Classified According to Type I: Item	Loading	Items Classified According to Type II: Item	Loading
2	0.90	1	-0.74
5	0.96	3	-0.72
7	0.96	4	0.99
9	-0.91	6	0.93
10	-0.94	11	0.55
12	0.68	13	-0.96
15	0.97	14	-0.84
16	0.96	21	0.90
17	-0.88	22	0.90
18	0.96	23	0.93
19	-0.96	30	-0.93
20	-0.91	36	-0.75
24	-0.71	37	-0.88
25	0.94	38	-0.96
26	0.94	45	0.66
27	-0.73		
28	0.97	Positive Pole: 7	
29	-0.97	Negative Pole: 8	
31	-0.92	Total: 15	
32	-0.86		
33	0.89		
35	-0.71		
39	0.68		
40	-0.80		
41	-0.97		
42	0.98		
43	0.98		
44	-0.87		
46	0.72		
Positive Pole: 15			
Negative Pole: 14			
Total: 29			

Number of Items Classified With Loading Criterion ¦.50¦: 44
Classification Efficiency: 96.65%
Total Percentage of Variance Explained: 86.35

Table 3-12

Stage 3 Classification Analysis - Sample 2

Items Classified According to Type I		Items Classified According to Type II	
Item	Loading	Item	Loading
1	0.66	4	0.88
2	0.97	6	0.75
3	-0.91	8	0.55
5	0.95	9	0.83
7	0.90	13	-0.95
10	-0.93	14	-0.79
11	0.63	22	0.75
12	0.57	23	0.93
15	0.98	30	-0.88
16	0.96	34	0.60
17	-0.95	37	-0.94
18	0.98	38	-0.97
19	-0.98	42	-0.80
20	-0.83	45	0.96
21	0.87		
24	-0.96		
25	0.85	Positive Pole:	8
26	0.99	Negative Pole:	6
27	-0.80	Total:	14
28	0.98		
29	-0.94		
31	-0.94		
32	-0.89		
33	0.79		
35	-0.57		
36	0.79		
39	0.83		
40	-0.89		
41	-0.95		
43	0.93		
44	-0.99		
46	0.81		
Positive Pole:	18		
Negative Pole:	14		
TOTAL	32		

Number of Items Classified With Loading Criterion ¦.50¦: 46
Classification Efficiency: 100.00%
Total Percentage of Variance Explained: 87.43

Table 3-13, also exhibited relatively similar magnitudes of loadings on each type.

Interpretation of the Modal Profiles

The factor scores in Table 3-10 describe the projections of the model-relevant variables on the principal factors of the item factor space. Their configural patterns thus are convenient interpretive devices useful in the labelling of derived clusters and dimensions. According to Skinner and Lei (1980), *T*-scores above 60 (i.e., 1 *SD* above the mean) in a profile are deemed to be salient or "present". In contrast, *T*-scores below 40 (i.e., 1 *SD* below the mean) indicate the relative "absence" of a given attribute, or attributes on which entities yield unusually low scores. Thus, the most "deviant" factor scores carry the most significant amount of weight in the interpretation of the derived Modal Profiles.

The profiles in Table 3-10 are representative of items with high positive loadings on item Factors I and II, respectively. Items with high negative loadings have profiles that closely correspond to the inverses of the Table 3-10 profiles. The magnitudes of the item factor loadings may be interpreted as indexes of the degree of resemblance between item profile and Modal Profile shapes.

MPI+: Referring to Figure 3-5, it can be seen that MPI+ is clearly a "High Coping Propensity" profile. This labelling is supported by the fact that the factor score for Coping Propensity is 1.8 *SD*'s above the mean. In addition to being representative of high Coping Propensity, MPI+ also appears to be "model-congruent". This is supported by the fact that the remaining variables in the profile exhibit a model-congruent configural pattern. For example, the Numerator, or stress expectancy associated with coping activity, is significantly smaller than the Denominator value ($t(14) = -16.76$, $p < .001$). This significant difference is obviously congruent with the below average level (i.e., .7 *SD*'s below the mean) of the cost of coping Ratio value. In addition, Stress Arousal is most closely associated

Table 3-13

Similar Item Factor Loadings From Samples 1 and 2

	Type I Loading			Type II Loading	
Item	Sample 1	Sample 2	Item	Sample 1	Sample 2
2	0.90	0.97	4	0.99	0.88
5	0.96	0.95	6	0.93	0.75
10	-0.94	-0.93	13	-0.96	-0.95
12	0.68	0.57	14	-0.84	-0.89
15	0.97	0.98	22	0.90	0.75
16	0.96	0.96	23	0.93	0.93
17	-0.88	-0.95	30	-0.93	-0.88
18	0.96	0.98	37	-0.88	-0.94
19	-0.96	-0.98	38	-0.96	-0.97
20	-0.91	-0.83	45	0.66	0.96
24	0.71	0.96			
25	0.94	0.85	Total # of Items: 10		
26	0.94	0.99			
27	-0.73	-0.80			
28	0.97	0.98			
29	-0.97	-0.94			
31	-0.92	-0.94			
32	-0.86	-0.89			
33	0.89	0.79			
35	-0.71	-0.57			
39	0.68	0.83			
40	-0.80	-0.89			
41	-0.97	-0.95			
43	0.98	0.93			
44	-0.87	-0.99			
46	0.72	0.81			
Total # of Items: 26					

with the Numerator value, or the lowest of the cost of coping Ratio components. Given that coping behaviour is associated with below average levels of stress expectancy, it is not surprising that Stress Arousal also is below average (i.e., .8 SD's below the mean).

Table 3-14 outlines the Sample 1 items clustering at the positive pole of Type I. Because of the high degree of overlap between Samples 1 and 2, it was deemed sufficient to present Sample 1 items only. The values in brackets at the end of each item indicate elevation parameters and Type I loadings, respectively. The elevation parameters indicate the average "height" of the item profile, calculated by averaging across model-relevant variables (e.g., see Skinner, 1975). The magnitudes of the Type I loadings indicate the degree of correspondence between the item profile and MPI+ profile shapes. Items are presented in order of descending elevation for MPI+ and all subsequent profiles.

The content of the MPI+ items gives an indication of the potential factors influencing high coping propensity. Although these are only anecdotal observations at present, an attempt will be made to verify them empirically in the context of Study Three. First, each situation appears to be characterized by a level of threat that is sufficient to warrant some type of coping activity. Empirically, this is indicated by the above average level of the Denominator variable, which may be used as a general indicant of the probability of stress impact. Thus, it follows that stress may have to reach a certain "threshold" level before coping activity will occur. Indeed, predominant definitions of stress (e.g., see Paterson & Neufeld, 1987) suggest that certain valued goals or ideals routinely must be compromised in stressful situations.

In addition, the situations appear to be accompanied by coping options that might be perceived as being easily enacted. Also, the coping options, at least in the face of the MPI+ situations, likely would be evaluated as being somewhat effective. Thus, the fact that they are endorsed clearly is in keeping with the tenets of Bandura's (1982) self-efficacy and outcome expectation theory. This theory

Table 3-14

Items in Sample 1 Classified at the Positive Pole of Type I

46. An apartment you have rented is in a rough part of the city with a high incidence of muggings and assaults. You can walk only in well-lighted and crowded areas. (.38, .72)*

12. Your new position will frequently require you to deliver oral presentations to persons who are known to be highly critical. You can invite criticism from your friends and colleagues in order to practice your responses. (.16, .68)

2. You are sailing with an inexperienced friend in waters that at times, can become extremely rough. You can put on a life jacket. (.10, .90)

42. Membership fees to join a private athletic facility have cost you several thousands of dollars. Recently, you have heard that the club is about to go bankrupt. You can organize with other members to find out what legal action is available to you in order to recover your losses. (.10, .98)

33. You are sailing with an inexperienced friend in waters that at times, can become extremely rough. You can check the local marine weather reports regularly. (.01, .89).

15. You are alone at night in a secluded country house where strangers sometimes come to the door. You can make sure that the doors are locked before settling down to watch TV. (-.09, .97)

16. A close long-term relationship appears as if it may become stifling. You can suggest novel activities that you can do with the person. (-.19, .96)

18. Since receiving your credit card you worry that you may be seriously in debt. You can set up rules and limitations on your spending and begin to adhere to them. (-.20, .96)

39. You are driving on an unfamiliar highway and sense, from the look of the sky, that you may soon run into a severe winter storm. You can check your road atlas to determine the location of the nearest service station. (-.22, .68)

5. You are sexually active and have been reading recently about the growing incidence of venereal disease in your area. You can make sure that a condom is used during intercourse. (-.29, .96)

26. You are sexually active and have been reading recently about the growing incidence of venereal disease in your area. You can insist on fidelity within your relationship. (-.34, .94)

25. You are going to visit a third world country where sanitary condition are poor. You can research the area so that you are familiar with the best health-care facilities should you become ill. (-.67, .94)

28. There has been a rash of burglaries in your neighbourhood and you must go out of town for several days. You can have your valuables stored in a safety deposit box. (-.85, .97)

*Note: Values in brackets indicate elevation parameters and loadings on Factor (Type) I, respectively.

43. You are going to visit a third world country where sanitary conditions are poor. You can make arrangements to stay exclusively in reputable North American hotels and resorts. (-1.11, .98)

7. There is a severe flu epidemic at your place of work and you must go out of town for several days. You can get a flu vaccine. (-1.15, .96)

*Note: Values in brackets indicate elevation parameters and loadings on Factor (Type) I, respectively.

suggests that if an individual feels able to execute a stress-mitigating coping option, his/her level of coping propensity will be relatively high.

While each of the aforementioned factors, in each of the aforementioned situations, may render the probability of coping quite high, the different profile elevations also suggest that coping propensity will vary as a function of the situation and the paired coping option. For example, referring to Table 3-14, and to Items 42 and 43, we can see item profiles with similar shapes. This is indicated by the fact that each shares an equal degree of resemblance (i.e., .98) with the shape of MPI+. However, their different elevations (.10 and -1.11, respectively) suggest that the averages of the model-relevant variables associated with each are considerably different. That is, the average level of these variables is substantially lower for Item 43 than it is for Item 42.

Although it is difficult to determine the variables that are most influential in determining differences in these profile elevations, one might hypothesize that levels of stress expectancy and overall levels of stress arousal would contribute strongly to these elevation differences. For, although in each item, it appears that engaging in coping activity is less stressful than doing nothing at all, engaging in such activity in the case of Item 42 would likely be associated with higher levels of stress expectancy and arousal. Instigating legal activity presumably would require considerably more personal investment than arranging accommodations at North American hotels. In addition, it may be perceived as a form of coping activity associated with less certainty about ultimate outcomes. Thus, although coping propensity would likely be high in Item 42, as its association with MPI+ suggests, its higher elevation nonetheless suggests that there might be some mitigation in coping propensity in comparison to Item 43.

MPI-: As is indicated by its low score on Coping Propensity (i.e., 1.8 SD's below the mean), MPI- is clearly a "Low Coping

Propensity" profile (i.e., see Figure 3-6). In addition, like MPI+, it appears to exhibit a configural pattern that largely is in keeping with the choice/control model. For example, low scores on Coping Propensity are accompanied by relatively high scores on the Ratio variable (.7 SD's above the mean), as would be predicted by the choice/control model. In addition, the Numerator variable [E(S)¦CA; .8 SD's above the mean] is significantly larger ($t(13) = 7.01$, $p < .001$) than the Denominator variable [E(S)¦NCA; .5 SD's below the mean], in accord with these latter associations. However, the level of Stress Arousal (.8 SD's above the mean) in the MPI- profile is not associated with the smallest of the Ratio components (i.e., the Denominator). Rather, it is substantially higher than the below average Denominator component, and is more aligned with the Numerator value.

The situations clustered under MPI- are outlined in Table 3-15. Clearly, they are of a more stressful nature than the situations clustered under MPI+, as is indicated by their content and higher average elevation ($M = .28$, $SD = .54$). In addition, they appear to be accompanied by relatively "risky" coping options with low efficacy and outcome expectations. It also is apparent that the situations frequently are concerned with stressful circumstances involving interpersonal threat. The coping options in MPI- almost universally require confrontations and/or threats to one's level of self-esteem. This may suggest that these types of options, in comparison to "non-interpersonal" acts, normatively are perceived as very difficult to undertake.

The increased stressfulness of the MPI- situations, in conjunction with their association with undesirable coping options, appears to explain part of the elevation in stress arousal in this profile. Although not engaging in coping activity would apparently be the normative choice in this cluster of items, it still might leave one confronted with a relatively stressful situation. However, the increased stressfulness of the situations does not explain why

Table 3-15

Items in Sample 1 Classified at the Negative Pole of Type I

44. Rumour has it that you are going to be confronted by your favourite professor about cheating on an exam. You can plead guilty and see if tnere is anything you can do to redeem yourself. (1.17, -.87)*

20. A friend has left town, apparently defaulting on a large bank loan which you co-signed. You feel that you may now be responsible for repaying the loan. You can declare personal bankruptcy, thereby making yourself exempt from repayment. (.95, -.91)

31. Rumour has it that you are going to be confronted by your favourite professor about cheating on an exam. You can withdraw from the course. (.69, -.92)

32. Due to economic cutbacks, there is a good possibility that your present position will be redefined and your salary greatly reduced. You can volunteer to put in extra time and take on additional responsibilities. (.60, -.86)

29. A close long-term relationship appears as if it may become stifling. You can break off with the person and actively seek out other relationships. (.55, -.97)

19. Circumstances suggest that you will soon have to break off a close relationship with someone you interact with regularly at work. You can ask your boss for a transfer. (.34, -.96)

9. You hear that a large company is going to be dumping hazardous chemicals into the river system in your area. You can help to organize a public action committee to investigate the company's practices. (.33, -.91)

27. Circumstances suggest that you will soon have to break off a close relationship with someone you interact with regularly at work. You can seek advice from close co-workers. (.32, -.73)

17. Word has it that your boss is going to ask you to work over the Christmas holidays and you feel that this is an unfair demand. You can write him a memo outlining the holidays you still have owing. (.25, -.88)

35. The number of cigarettes you smoke in a day has increased and lately, you have developed what appears to be a chronic cough. You can switch to a brand of low tar and nicotine cigarette. (.20, -.71)

24. Personal problems are escalating to the point where they may soon interfere with your performance at work. You can seek professional help from the company's counsellor. (.16, -.71)

41. There has been a rash of burglaries in your neighbourhood and you must go out of town for several days. You can postpone your trip until a time when it seems safer. (-.44, -.97).

*Note: Values in brackets indicate elevation parameters and loadings on Factor (Type) I, respectively.

10. You are driving on an unfamiliar highway and sense, from the look of the sky, that you may soon run into a severe winter storm. <u>You can pull over and get your road flares out of the trunk</u>. (-.51, -.94)

40. Since receiving your credit card you worry that you may be seriously in debt. <u>You can cut up your credit card</u>. (-.74, -.80)

*<u>Note</u>: Values in brackets indicate elevation parameters and loadings on Factor (Type) I, respectively.

anticipatory stress arousal is most closely allied with the Numerator component. Although the situations are stressful, their elevations are not, in many cases, so high that they would actually be considered "dire". In addition, as was stated, there are significant differences between the values of the Numerator and Denominator components. This would seem to suggest a clear choice of the "no coping" option among the MPI- situations. Under conditions such as these, one would certainly expect stress arousal to be primarily associated with the smallest Ratio component (i.e., the Denominator). Although the Numerator is substantial, it in essence, should cease to be influential due to its being the option to be discarded. However, in MPI-, the situational stress encompassed by the Numerator appears to have an influence on anticipatory stress arousal. That is, it appears to inflate it above a level that one might expect in a situation where the choice among coping options seems clear.

Thus, tentatively, it may be suggested that in certain respects at least, MPI- is "model-incongruent". Specifically, it does not support the hypothesis that stress arousal primarily will be a function of the smallest of the Numerator or Denominator components. Although conjectures previously have been made regarding increases in stress arousal with increases in the smallest of the Ratio components (Neufeld, 1982) similar conjectures have not been as well developed in regard to the largest of the Ratio components.

MPII+: MPII+ is characterized by extremely high Ratio levels (1.7 SD's above the mean) in conjunction with extremely low Denominator [E(S)|NCA] values (1.3 SD's below the mean). According to the choice/control model, each of these variable levels should be accompanied by extremely low levels of Coping Propensity. However, as Figure 3-7 suggests, the high Ratio and low Denominator values are accompanied by above average levels of Coping Propensity (.6 SD's above the mean). In addition, they are accompanied by below average levels of stress arousal, in spite of the extremely high Ratio level. Thus, it clearly seems appropriate to designate MPII+ as being a "model-incongruent" profile. It represents a configural pattern that is almost completely opposite to that which would be predicted by the structure of the choice/control model.

Referring to Table 3-16, it can be seen that the majority of MPII+ items are characterized by relatively low levels of stress. This is supported empirically by the fact that the Numerator, Denominator, and Stress Arousal variables all have values that are below average (i.e., see Figure 3-7). In addition, it is supported by the low average elevation characterizing this cluster of seven situations (M = -.44, SD = .42). This average elevation is obviously substantially lower than that found in the MPI+ and MPI- clusters.

In terms of content, the situations appear to be paired with coping options that are easily executable and relatively effective. However, according to judges' ratings, the execution of these options is still more stressful than doing nothing at all. Thus, from a decision theoretical perspective, the above average levels of Coping Propensity appear to be highly model-incongruent. From a decisional perspective, one would expect the chosen option to be associated with lowest stress expectancy value (i.e., the Denominator).

Although the fact that MPII+ is characterized by above average Coping Propensity is not in keeping with the choice/control model, a potential explanation for this pattern may lie in a comparison of the magnitudes of the Numerator and Denominator judgments. In a comparison of these components, it was revealed that the Numerator and Denominator values were not significantly different ($t(6) = 2.07$, $p > .05$). Thus, from a psychological point of view, subjects likely were not making clear distinctions between the relative magnitudes of these components. The proximity of the components clearly is sufficient to explain the extremely high magnitude of the Ratio variable. It also may explain (although not resolve the incongruent nature) of the above average level of Coping Propensity. Given that subjects, in the absence of

Table 3-16

Items in Sample 1 Classified at the Positive Pole of Type II

6. The number of cigarettes you smoke in a day has increased and lately, you have developed what appears to be a chronic cough. You can join a quit-smoking group organized through your local Y. (.23, .93)*

4. Having moved to a new city, you worry that you may find it difficult to meet people. You can join a club sponsoring activities that interest you. (-.16, .99)

23. Having moved to a new city, you worry that you may find it difficult to meet people. You can immediately introduce yourself to all your nearest neighbours. (-.28, .93)

21. An apartment you have rented is in a rough part of the city with a high incidence of muggings and assaults. You can take a course in self-defense. (-.36, .90)

22. The main route to your destination is through a stretch of treacherous mountain highway. You can take an alternative circuitous route that is considerably longer. (-.78, .90)

11. The main route to your destination is through a stretch of treacherous mountain highway. You can take an alternative form of transportation. (-.83, .55)

45. There is a severe flu epidemic in your place of work which so far, has left you unaffected. You can make arrangements to work at home as much as possible. (-.93, .66)

*Note: Values in brackets indicate elevation parameters and loadings on Factor (Type) II, respectively.

quantitative referents, did not distinguish between Numerator and Denominator values, they simply may have determined that given that both options were "equal", they might as well endorse an inclination to act. It has been noted that in certain situations, people's "drives" or learned strivings may be instrumental in dictating behaviour (Fisher, 1986). In North American society, a commonly learned striving is to "do something" and take instrumental action. Such ambitions have been incorporated into theories of mastery and control which suggest that humans have innate drives to strive toward competence (e.g., see Fisher, 1986). Such a competence motive may have contributed in part to the endorsement of coping likelihood in MPII+, especially given the easily executable and potentially efficacious nature of the MPII+ coping options.

Although the MPII+ profile may logically be explained via a more thorough examination of its components, it still raises important issues for the choice/control model in terms of its predictions regarding Stress Arousal. The choice/control model suggests that as the Ratio approaches one, stress arousal concomitantly will increase. This is because in addition to the selected option, the influence of decisional conflict also will act to increase anticipatory stress arousal. However, the MPII+ profile suggests that the tenability of this prediction depends on the magnitudes of the Ratio components; in a situation where they are both below average, as they are in MPII+, it clearly does not appear to hold. Of course, the argument could be raised that because of their low stress expectancy values, the MPII+ situations do not fall within the stress domain. It, in turn, could be argued that they do not represent adequate tests of the model, since the model is intended for the stress-relevant domain. Further investigations will have to be undertaken before such a conclusion can be drawn. However, one may still justifiably state that MPII+ raises important potential issues for the tenability of the choice/control model.

MPII-: MPII- is characterized by extremely low Ratio levels (1.7 SD's below the mean) and extremely high Denominator [E(S)|NCA] values (1.3 SD's above the mean). Thus, according to the choice/control model, situations clustered under this profile should be characterized by high levels of Coping Propensity. However, as the graphic representation in Figure 3-8 suggests, Coping Propensity is below average for this profile (.6 SD's below the mean). In addition, it is characterized by above average levels of stress arousal, in spite of its extremely low Ratio level.

Although MPII- appears at first glance to be "model-incongruent", it may in fact, be an extremely model-congruent profile. This labelling is supported by two, interrelated pieces of evidence regarding the magnitude and position of the Numerator and Denominator values. First, as was the case in the MPI+ profile, the Numerator and Denominator are significantly different ($t(7) = -3.63$, $p < .01$). That is, the Numerator is significantly smaller than the Denominator in MPII-, thus supporting the below average Ratio level. However, although it is statistically different, the discrepancy between the Numerator and Denominator values, in terms of absolute magnitude, is not large (-.98 versus -1.34 in MPI+). In addition, both the Numerator and Denominator values are above the mean in MPII-, whereas they were on opposite sides of the mean in MPI+. Thus, from a psychological perspective, the discrepancies between the Numerator and Denominator values may not have been as salient or clear to the judges. This would be in keeping with decisional studies which suggest that contextual factors influence greatly the perception of decisional alternatives (e.g., see Hogarth, 1987; Payne, 1982). From the perspective of the judges, both options apparently were stressful, although one option (coping) was more favourably endorsed. However, this endorsement was not "enthusiastic", as is clearly indicated by the below average level of Coping Propensity in MPII-.

In addition, although coping activity was the preferred normative strategy for controlling the MPII- situations, it was not necessarily associated with low stress arousal, as was the case in MPI+. In fact, this profile appears to represent situations where stress arousal may be enhanced due to increased decisional conflict. As Table 3-17 suggests, the items clustered under MPII- are accompanied by coping options that may be ineffective. Thus, although they might be engaged in, they likely would do little to mitigate stress arousal in the face of the stressful situations with which they are paired. Perceptually, this would act to reduce the discrepancy between the Numerator and Denominator, and to enhance stress arousal due to decisional conflict. Indeed, the situations in this cluster were the most stressful of all the situations, as the Denominator and mean elevation values (M = .36, SD, .32) suggest. Thus, in essence, they appeared to represent "no win" situations, where neither alternative was attractive.

Discussion

A summary of the four modal profile clusters derived in Study Two is outlined in Table 3-18. The table summarizes the salient profile characteristics, in addition to the choice/control hypotheses supported and disconfirmed by the profiles, and the apparent conditions under which confirmation and disconfirmation occurred.

In general, the Modal Profile Analysis provided clear empirical support for three of the primary relationships proposed by the choice/control model. First, MPI+ and MPI- clearly supported the proposed inverse relationship between Coping Propensity and the cost of coping Ratio. Further, these modal profile clusters suggested that the Coping Propensity/Ratio hypothesis may be most likely to be supported when the Numerator and Denominator of the cost of coping Ratio lie on opposite sides of the mean, and when the magnitude of the discrepancy between these Ratio components is large enough to render them both statistically and psychologically distinct. Second, MPI+ also suggested that stress arousal will often be a function of the smallest of the cost of coping Ratio components. Again, this hypothesis seemed to be most clearly supported when the Numerator and Denominator components were

Table 3-17

Items in Sample 1 Classified at the Negative Pole of Type II

38. A friend has left town, apparently defaulting on a large bank loan which you co-signed. You feel that you may now be responsible for repaying the loan. You can get in touch with the person's family and try to work out a settlement. (1.07, -.96)*

13. Due to economic cutbacks, there is a good possibility that your present position will be redefined and your salary greatly reduced. You can make your position seem more valuable by convincing your employer that your are able to fill a need within the company which currently is not being met. (.54, -.96)

14. Membership fees to join a private athletic facility have cost you several thousands of dollars. Recently, you have heard that the club is about to go bankrupt. You can research the financial status of the club. (.35, -.84)

37. Personal problems are escalating to the point where they may soon interfere with your performance at work. You can request a leave of absence until you can get your problems sorted out. (.31, -.88)

30. While cross-country skiing in a remote area, you hear on your transistor radio that a severe storm may soon hit. You can stop skiing and seek out a place of shelter. (.26, -.93)

1. While cross-country skiing in a remote area, you hear on your transistor radio that a severe storm may soon hit. You can contact the weather station via walkie-talkie and notify them of your whereabouts. (.16, -.74)

3. You hear that a large company will be dumping hazardous chemicals into the river system in your area. You can sell your home and move away. (.12, -.72)

36. Your new position will frequently require you to deliver oral presentations to persons who are known to be highly critical. You can arrange to take a course in public speaking in your spare time. (.08, -.75)

*Note: Values in brackets indicate elevation parameters and loadings on Factor (Type) II, respectively.

Table 3-18

Summary of Study Two Modal Profile Clusters

Modal Cluster	Characteristics	Hypotheses Confirmed/ Disconfirmed
MPI+ ("High Coping Propensity" Situations)	Numerator and Denominator statistically and psychologically distinct, and positioned on opposite sides of the mean; threat high enough to warrant coping activity; coping option easily enacted and potentially effective	Confirmed 1. CP/Ratio 2. SA/Lowest Ratio Component
MPI- ("Low Coping Propensity" Situations)	Numerator and Denominator statistically and seemingly, psychologically distinct; relatively high stress situations; risky coping options with potentially low efficacy and outcome expectations	Confirmed 1. CP/Ratio Disconfirmed 1. SA/Lowest Ratio Component
MPII+ ("Low Stress" Situations)	Numerator and Denominator statistically and psychologically indistinct, and both below average in magnitude; coping options easily executable and relatively effective	Disconfirmed 1. CP/Ratio 2. SA/Ratios-Near-One
MPII- ("High Stress" Situations)	Numerator and Denominator statistically, but apparently, not psychologically distinct, and both above average in magnitude; potentially difficult and potentially ineffective coping options	Confirmed 1. SA/Ratios-Near-One

Note: "CP/Ratio" refers to the proposed inverse relationship between Coping Propensity and the cost of coping Ratio.

"SA/Lowest Ratio Component" refers to the hypothesis that stress arousal will primarily be influenced by the lowest of the cost of coping Ratio components.

"SA/Ratios-Near-One" refers to the hypothesis that stress arousal will increase due to decisional uncertainty as the cost of coping Ratio approaches One.

statistically and psychologically distinct, and when they were positioned on opposite sides of the mean. An anecdotal content analysis of the MPI+ items also suggested that this stress arousal hypothesis may be most likely to be supported when the efficacy and outcome expectations associated with the situational coping options are clear to participating judges. Finally, MPII- supported the choice/control hypothesis that stress arousal will increase as a function of decisional uncertainty when the cost of coping Ratio approaches one. This hypothesis appeared to be supported when the Numerator and Denominator values of the cost of coping Ratio both were positioned above the mean (connoting relatively high stress situations), and when the constituent components of the cost of coping Ratio were psychologically, versus statistically, indistinct. In addition, there was some evidence that the coping options in the MPII- cluster were potentially difficult to execute and potentially ineffective.

Although the Modal Profile Analysis rendered clear empirical support for the three choice/control hypotheses outlined above, it also produced clusters of situations which suggested that support for these predictions may inherently be dependent on the conditions under which the hypotheses are tested. More specifically, certain model-incongruent modal profile clusters (i.e., MPI- and MPII+) suggested that verification of the choice/control hypotheses ultimately may be a function of the magnitude, relative position of, and discrepancy between, the cost of coping Ratio components.

Potential Qualifications to the Proposed Inverse Relationship Between Coping Propensity and the Cost of Coping Ratio

Although not discussed previously, a comparison of MPII+ (the cluster of "low stress", relatively less-threatening situations) and MPII- (the cluster of "high stress", "no win" situations), and their respective Ratio and Coping Propensity values, suggested that support for the hypothesized inverse relationship between the Ratio and Coping Propensity clearly would be dependent on the magnitudes and relative positions of the cost of coping Ratio components. The Ratio value in MPII-, for example, proved to be substantially lower than that in MPII+. Thus, the hypothesized inverse relationship between Coping Propensity and the Ratio suggests that Coping Propensity should have been higher in the MPII- cluster. However, in contradiction to the predictions of the choice/control model, the level of Coping Propensity in MPII+ was considerably higher than it was in MPII-. Clearly, this discrepant finding was attributable to differences in the magnitudes and relative positions of the constituent components of the MPII+ and MPII- Ratios.

In MPII+, the Numerator and Denominator values of the Ratio were both low, and psychologically indistinct. Thus, the high Ratio value in the MPII+ profile clearly was a function of less-threatening, and "perceptually equivalent" coping alternatives, which engendered higher than expected levels of Coping Propensity. What the MPII+/MPII- comparison suggests then, is that the magnitudes and relative positions of the constituent Ratio components routinely should be assessed in evaluating the tenability of the Coping Propensity/Ratio hypothesis. In cases where high Ratios are comprised of low, and perceptually equivalent Numerator and Denominator values, this hypothesis is not likely to be supported.

Potential Qualifications to Hypotheses Regarding Anticipatory Stress Arousal

The choice/control model suggests that stress arousal primarily will be determined by the smallest of the Numerator or Denominator Ratio components. In addition, it predicts that stress arousal will increase due to decisional conflict as the value of the Ratio approaches one. Although each of these hypotheses received clear empirical support in the MPI+ and MPII- clusters, respectively, they also appeared to be subject to certain qualifications following an analysis of the MPI- and MPII+ clusters.

Potential Qualifications to the "Stress Arousal/Lowest Ratio Component" Hypothesis: In MPI-, the discrepancy between the Numerator and Denominator components was large enough to produce an apparently clear preference for the "no coping" (i.e., Denominator) option. However, in opposition to the predictions of the choice/control model, this apparently "clear choice" among coping options did not result in a situation where the largest of the Ratio components (i.e., the Numerator) ceased to be influential in terms of its impact on anticipatory stress arousal. In fact, in MPI-, self-reported anticipatory stress arousal appeared to be most closely aligned with the largest of the Ratio components. This was in spite of the fact that the preferred coping option seemed clear, and was associated with significantly lower levels of stress expectancy.

Although only speculative, it is possible that in MPI-, the influence of certain "context effects" altered the psychological distinction between the Ratio components, and thus, the predicted relationship between stress arousal and the smallest of the cost of coping Ratio components. This possibility emerged as a result of a closer consideration of the MPI- item characteristics.

First, the MPI- items were characterized by relatively high degrees of stress. This would thus suggest that when evaluating these situations, judges likely would have been motivated to engage in some form of stress-mitigating action. Second, the MPI- situations also were accompanied by relatively risky coping options with potentially low efficacy and outcome expectations. Thus, although the stressfulness of the situations may have induced a potential motivation to take action, the nature of the available coping options, in many of the MPI- situations, would have made pursuit of this action seem undesirable. In the MPI- situations then, the coexistence of these "incompatible" response tendencies may greatly have elevated levels of anticipatory stress arousal. Indeed, there is considerable empirical evidence that conflict over response emission versus inhibition is a source of stress arousal in its own right (e.g., see Maher, 1966). The juxtaposition of these incompatible response tendencies may have enhanced stress arousal by reminding subjects that they were in potentially "no win" situations. This recognition, in turn, may have reduced the degree of perceptual distinctiveness between the Numerator and Denominator Components, and resulted in levels of stress arousal that would not have been predicted by the mathematical distinctiveness of the Ratio components.

Thus, in MPI-, the level of stress arousal may not have been a function of the largest Ratio component per se. Rather, it may have been a function of certain "context effects" induced by the unique pairing of certain Numerator- and Denominator-related response characteristics. Although such a hypothesis must necessarily remain speculative pending further verification, it nonetheless does suggest that when similar context effects occur, the hypothesis regarding the primary influence on stress arousal of the smallest of the Ratio components may not hold.

Potential Qualifications to the "Stress Arousal/Ratios-Near-One" Hypothesis: The hypothesis that decisional uncertainty should produce increased levels of stress arousal as the cost of coping Ratio approaches one clearly was called into question as a result of the pattern of findings associated with MPII+. As was mentioned above, the constituent values of the cost of coping Ratio in MPII+ were both low and psychologically indistinct. Thus, not surprisingly, the close proximity of these components produced a correspondingly high value of the cost of coping Ratio. However, rather than producing increased levels of stress arousal, which presumably were reflective of decisional uncertainty, these situations simply engendered levels of stress arousal that were reflective of the low stress situations they were tapping. Thus, while this pattern clearly was in keeping with the notion that decreased magnitudes of components should produce decreased levels of stress arousal (see Neufeld, 1982), it was not in keeping with the prediction that increased cost of coping Ratios should produce increased, conflict-induced stress arousal. In fact, what MPII+ clearly suggested was that when high Ratios are produced by constituent components of similarly low values, the hypothesis regarding increased, conflict-induced stress arousal will not hold. In such situations, the choice among options generally will be inconsequential, and decisional uncertainty will be low. Possibly, this suggests that the salience of the Numerator/Denominator equivalency, and hence, the degree of response conflict, requires a minimal componential magnitude.

Additional Observations Regarding "Testable Implications" of the Choice/Control Model: Previously, it has been hypothesized that certain changes in the constituent values of the cost of coping Ratio should leave Coping Propensity intact (e.g., see Neufeld, 1982). More specifically, it has been hypothesized that Coping Propensity should remain intact when different constituent values generate similar Ratio levels. Thus, according to this logic, situations characterized by Ratios of 1/2 and 3/6 should generate similar levels of Coping Propensity. Despite differences in the Numerator and Denominator values in each of these situations, both still generate cost of coping Ratios of 0.5.

Although logical, this hypothesis was not consistently supported by the data of the present study. Rather, variations in the magnitudes of similar Ratio components appeared to influence directly, the magnitude of Coping Propensity. For example, although MPI- and MPII+ represented profiles with relatively similar Ratio values, they engendered very different levels of Coping Propensity, as Figures 3-6 and 3-7 suggest. When constituent Ratio values were both uniformly low, as they were in cluster MPII+, Coping Propensity appeared to be inordinately high. However, when constituent values were substantially higher, as they were in cluster MPI-, the choice among options became clearer, and Coping Propensity decreased accordingly. Thus changes, in constituent values appeared to have clear implications for the levels of Coping Propensity. Specifically, they suggested considerable variation 2in Coping Propensity with similar Ratio values, but as a function of the latter's absolute magnitude.

Summary

The Modal Profiles generated during Study Two provided clear support for, and also placed certain limitations on, the validity of the choice/control model. In regard to model support, they suggested that the Coping Propensity/Ratio hypothesis and the Stress Arousal/Lowest Ratio Component hypothesis were most likely to be supported: (a) when the Numerator and Denominator of the cost of coping Ratio were statistically and psychologically distinct; (b) when these latter components were positioned on opposite sides of the mean; and (c) when outcome and efficacy expectations associated with coping options clearly were discernible to participating judges. In addition, they suggested that the "Stress Arousal/Ratios Near One" hypothesis was most likely to be supported: (a) when the Numerator and Denominator both were above the mean and were psychologically indistinct; and (b) when negative and/or uncertain outcome and efficacy expectations were associated with the situational coping options.

In addition to providing clear support for the choice/control model, the Study Two Modal Profiles also suggested that the tenability of certain choice/control hypotheses would vary as a function of the magnitude and discrepancy between Ratio components. For example, when the Ratio components were both low, and psychologically indistinct, the hypothesis regarding increased stress arousal with Ratios near one clearly was not supported. In addition, when specific magnitudes of, and discrepancies between, Ratio components produced seemingly unpredicted "context effects", the hypothesis regarding stress arousal and the lowest of the cost of coping Ratio components also did not hold. Clearly, these conclusions will have to be verified using different stressful situations and experimental settings. However, at present, they suggest that the nature of certain proposed dimensional relations among prominent choice/control constructs may be in need of future qualification.

CHAPTER 4. STUDY THREE

The Modal Profile Analysis in Study Two suggested the presence of two, replicable item profiles across two samples. It did not, however, independently assess the external validity of these profiles as a means of further substantiating their tenability and meaning. Thus, the goal of Study Three was to determine the degrees of association between Modal Profile parameters and independently selected variables. Such an analysis was deemed necessary to support the external validity of the derived Modal Profiles, and to verify the tenability of their "rationally imposed" meanings.

Ratings for Study Three were collected on 11 external validation variables selected from the decision-theoretical and stress domains. Ratings were divided among two questionnaires, which tapped five and six variables, respectively. A total of 30 subjects were required to complete each of the questionnaires, with subjects randomly being assigned to one questionnaire only. Subjects receiving the first questionnaire were asked to respond to the following five questions in relation to each of the 46 situation/coping option pairs:

(a) How effective do you think the underlined coping option would be in terms of its ability to remedy this stressful situation?

(b) How likely would you be to experience a sense of control if you were to engage in the underlined option?

(c) Rate the underlined coping option in terms of the amount of physical effort it would require.

(d) Rate the underlined coping option in terms of the amount of emotional effort it would require.

(e) How confident would you be that you would have the resources it would take to carry out the underlined coping option?

Variables rated on this questionnaire were designed to tap coping outcome and efficacy expectations (e.g., see Bandura, 1982), as is indicated by ratings (a) and (e). In addition, they were designed to tap the influence of control and effort, as is indicated by items (b), (c), and (d). Each of these dimensions previously has been noted in the decisional and/or stress literatures to exert a considerable influence on coping behaviour (e.g., see Bandura, 1982; Fisher, 1986; Janis & Mann, 1977; Lazarus & Folkman, 1984). Each also has been incorporated into more formal and quasi-formal approaches to the study of stress-relevant behaviour (e.g., Neufeld, 1990a, 1990b; Morrison et al., 1988).

Subjects receiving the second questionnaire were asked to respond to the following six questions in relation to each of the 46 situation/coping option pairs:

If you were to engage in the underlined coping option, how likely would it be that:

(a) Your sense of self-esteem/personal integrity would be threatened?

(b) Your financial security would be threatened?

(c) Your physical health would be threatened?

(d) Your emotional well-being/happiness would be threatened?

(e) The stability of your life would be threatened?

(f) The well-being of others would be threatened?

Variables tapped by this questionnaire were designed to tap certain costs associated with coping previously identified in the decisional and stress literatures (e.g., see Janis & Mann, 1977; Lazarus & Folkman, 1984; Magnusson & Ekehammar, 1975).

Method

Subjects

Subjects were 30 males and 30 females from the University of Western Ontario Introductory Psychology subject pool. All participants received one course credit for their participation in the study.

Procedure

Testing sessions were run in groups, with subjects being asked to endorse one of the two possible questionnaires within each testing session. Fifteen males and 15 females endorsed each of the two questionnaires, resulting in a total of 30 subjects responding to each questionnaire. Ratings to questions were made on a 9-point scale, with end-points being reversed for exactly half the items.

Results

The correlations between the 11 external validation variables are outlined in Table 4-1. As is apparent, there were high degrees of association, in directions that theoretically would be expected, between many of these external rating variables. Thus, a principal components analysis was performed to reduce the 11 variables to a smaller, more parsimonious set. The unrotated factor matrix, containing factor loadings and eigenvalues, is outlined in Table 4-2. Figure 4-1 portrays the results of the scree test resulting from the principal components analysis. According to the scree test, 3 of the 11 principal components generated were suitable for retencion and rotation to simple structure. The varimax rotated factor matrix, containing factor loadings of $|.30|$ or greater, is outlined in Table 4-3.

Factor I: Variables loading highly at the positive pole of Factor I included Threat to Life Stability, Threat to Emotional-Well Being, and Threat to Self-Esteem. Amount of Emotional Effort Required also loaded highly on this Factor, suggesting a constellation of psychologically, self-threatening variables. Variables with moderate loadings included Threat to Financial Security and Amount of Physical Effort Required. The single variable loading at the negative pole of Factor I was Confidence in Resources to carry the coping option out. Thus, in general, Factor I appeared to represent effortful, psychologically self-threatening coping options which individuals were not confident they had the resources to carry out.

Factor II: Variables loading highly at the positive pole of Factor II included Effectiveness and Control engendered by the coping option. Variables with moderate to low positive loadings included Confidence in Resources, Amount of Physical Effort, and Threat to Emotional Well-Being. The single variable loading relatively weakly at

Table 4-1

Correlations Between "External Validation" Variables

	TSTM	TFIN	TPHY	TEMT	TLFS	TWBO	EFCT	CTRL	PFRT	EFRT	RSRC
TSTM		.46	.05	.89	.80	.20	-.37	-.43	.18	.61	-.58
TFIN			.28	.47	.68	.59	-.23	-.35	.20	.46	-.46
TPHY				.10	.25	.70	-.28	-.32	.17	.10	-.20
TEMT					.89	.29	-.45	-.48	.26	.61	-.61
TLFS						.52	-.42	-.51	.33	.69	-.67
TWBO							-.22	-.33	.27	.40	-.41
EFCT								.94	.08	-.13	.66
CTRL									.08	-.23	.71
PFRT										.52	-.37
EFRT											-.68

TSTM = Threat to Self-Esteem/Personal Integrity
TFIN = Threat to Financial Security
TPHY = Threat to Physical Health
TEMT = Threat to Emotional Well-Being/Happiness
TLFS = Threat to Life Stability
TWBO = Threat to Well-Being of Others
EFCT = Perceived Effectiveness of Coping Option
CTRL = Likelihood of Coping Option Engendering Sense of Control
PFRT = Amount of Physical Effort Coping Option Would Require
EFRT = Amount of Emotional Effort Coping Option Would Require
RSRC = Confidence That One Would Have the Resources to Carry Coping Option Out

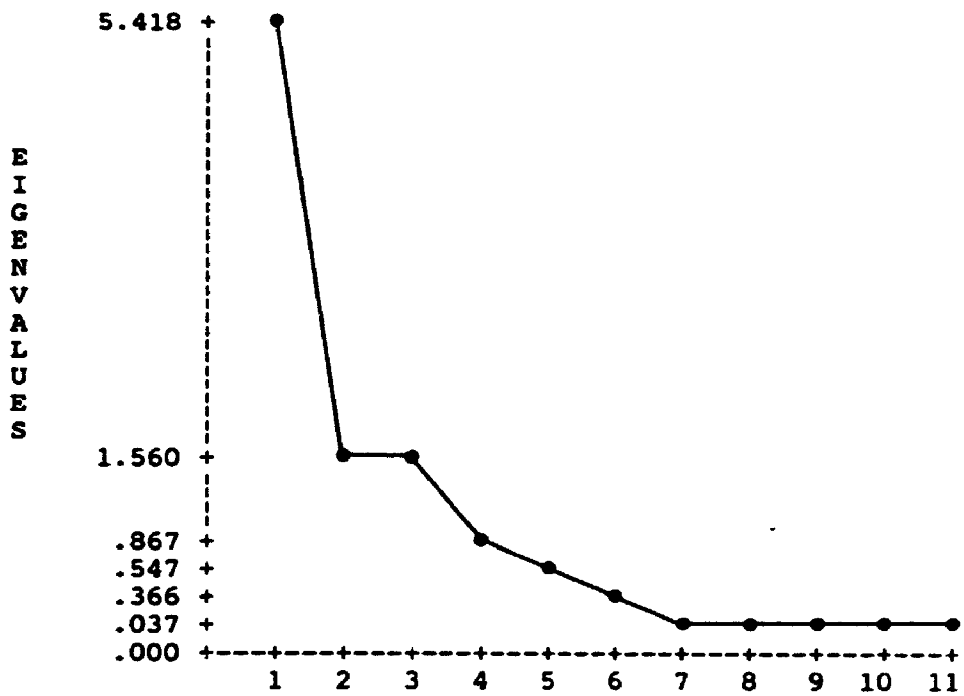


Figure 4-1: Scree test for principal components analysis of external validation variables.

Table 4-2

Unrotated Factor Matrix Resulting From Principal Components Analysis of External Validation Variables

	I	II	III
Threat to Life Stability	.91974	.17151	-.08960
Confidence in Resources	-.85004	.10475	.10122
Threat to Emotional Well-Being	.84192	.11965	-.34977
Threat to Self-Esteem	.78737	.14359	-.41383
Emotional Effort Required	.73110	.48633	-.08573
Sense of Control Engendered	-.70065	.66891	.06096
Threat to Financial Security	.68593	.14631	.24388
Perceived Effectiveness of Option	-.62095	.71774	.11320
Amount of Physical Effort Required	.36736	.61505	.19606
Threat to Physical Health	.37763	-.20856	.78883
Threat to Well Being of Others	.60150	.04780	.71032
Eigenvalues	5.41814	1.71992	1.56048

Table 4-3

External Validation Variables with Salient Loadings (±.30 or greater) on the First Three Varimax Rotated Factors

	I	II	III
Threat to Life Stability	.86		
Threat to Emotional Well-Being	.86	.33	
Amount of Emotional Effort Required	.86		
Threat to Self-Esteem	.85	-.30	
Confidence in Resources	-.67	.49	
Threat to Financial Security	.55		.49
Amount of Physical Effort Required	.53	.42	.31
Effectiveness of Option		.92	
Sense of Control Offered by Option		.91	
Threat to Well-Being of Others			.89
Threat to Physical Health			.88

the negative pole was Threat to Self-Esteem. Thus, in general, Factor II appeared to represent highly effective coping options associated with control and efficacy outcome expectations. However, it also appeared to represent options requiring some level of physical effort and a slight risk to emotional well-being.

Factor III: Variables loading highly at the positive pole of Factor III included Threat to Well-Being of Others and Threat to Physical Health. Variables with moderate to low positive loadings included Threat to Financial Security and Amount of Physical Effort Required. In contrast to Factor I, Factor III appeared to represent non-psychologically self-threatening coping options concerned with relational, financial, and physical threats. Although this factor was difficult to label, it tentatively was designated as representing coping options associated with non-psychologically self-threatening outcomes.

Subsequent to the factor analysis of the external validation variables, factor scores were generated for each of the 46 situation/coping option pairs. Table 4-4 outlines the correlations between these factor scores and the Modal Profile I and II elevation and shape parameters.

Correlations with Factor Score 1: The Factor Score 1/Elevation correlations for both Samples 1 and 2 were moderate and positive in nature (i.e., .46 and .40, respectively). This suggested that as the effortfulness and psychological self-threat associated with the 46 coping options increased, so also did the "heights" of the 46 corresponding item profiles. As was mentioned previously, increased profile height was likely attributable to increased levels of stress arousal and stress expectancy. Thus, the positive correlations between Factor Score 1 and the elevation parameters appeared to lie in the appropriate direction.

For both Samples 1 and 2, the Factor Score 1/Loading I correlations were moderate and negative in direction (i.e., -.45 and -.48, respectively). Thus, as the effortfulness and psychological self-

Table 4-4

Correlations Between Factor Scores and Sample 1 and 2 Elevations and Factor Loadings

	FSCR1	FSCR2	FSCR3	S1ELVN	S1LDI	S1LDII	S2ELVN	S2LDI	S2LDII
FSCR1		.00	.00	.46	-.45	.00	.40	-.48	-.13
FSCR2			.00	-.35	.41	.16	.35	.53	-.04
FSCR3				.35	-.07	-.35	.33	-.02	-.21
S1ELVN					-.40	-.46	.95	-.45	-.34
S1LDI						-.21	-.33	.90	-.14
S1LDII							-.47	-.17	.77
S2ELVN								-.38	-.35
S2LDI									-.20
S2LDII									

FSCR1 = Factor Scores on Factor I
FSCR2 = Factor Scores on Factor II
FSCR3 = Factor Scores on Factor III
S1ELVN = Sample 1 Elevations
S1LDI = Sample 1 Loadings on Modal Type I
S1LDII = Sample 1 Loadings on Modal Type II
S2ELVN = Sample 2 Elevations
S2LD1 = Sample 2 Loadings on Modal Type I
S2LDII = Sample 2 Loadings on Modal Type II

threat associated with the coping options increased, Coping Propensity concomitantly decreased. Such a relationship previously has been noted in the stress-relevant literature (e.g., see Fisher, 1986; Lazarus & Folkman, 1984) and also in the literature on outcome expectations (Bandura, 1982). It also clearly distinguished the two clusters of situations at the positive and negative poles of Modal Profile I.

Finally, for both Samples 1 and 2, the Factor Score 1/Loading II correlations were small and nonsignificant (i.e., .00, -.13). Thus, scores on effortfulness and psychological self-threat appeared to be of little utility in terms of elucidating the relationship between item profile and Modal Profile II (i.e., High Ratio, low [E(S)¦NCA]) shapes.

<u>Correlations with Factor Score 2</u>: For both Samples 1 and 2, the Factor Score 2/Elevation correlations were negative and moderately low (i.e., -.35 and -.35, respectively). Thus, increases in the perceived effectiveness and control associated with the 46 coping options tended to be associated with decreases in the heights of the item profiles. Given that profile elevation largely reflects the overall stressfulness of the situation/coping option pairs, this relationship was in the expected direction.

For both Samples 1 and 2, the Factor Score 2/Loading I correlations were moderate and positive in direction (i.e., .41 and .53, respectively). Thus, not surprisingly, as the perceived effectiveness and control associated with the coping options increased, so also, did Coping Propensity.

Finally, as was the case with Factor Score 1, the Factor Score 2/Loading II correlations were low and nonsignificant. Thus, the Factor II scores contributed little to the understanding of the factors influencing the resemblance between item profile and Modal Profile II shapes.

<u>Correlations with Factor Score 3</u>: For both Samples 1 and 2, the Factor Score 3/Elevation correlations were moderately low and positive

in direction (i.e., .35 and .33, respectively). Thus, as the degree of non-psychological self-threat associated with the 46 coping options increased, so also did the heights of the corresponding item profiles.

Factor Score 3 was not significantly associated, in either Sample 1 or 2, with loadings on the first typal dimension (i.e., r = -.07 and -.02, respectively). Thus, the degree of non-psychological threat associated with the situation/coping option pairs did not appear to contribute to Coping Propensity.

Finally, for Sample 1 only, there was a slight tendency for degree of nonpsychological threat to be related to loadings on Modal Profile II (i.e., Factor Score 3/Loading II correlation = -.35). Given that positive Profile II loadings were suggestive of high Ratios and low Denominator [E(S)¦NCA] values, this relationship was in the predicted direction. However, given that the relationship did not replicate across samples, it is possible that it was a function of sampling error. Thus, the Factor Score 3/Loading II correlation must be interpreted with caution.

Elevation/Loading Correlations: For both Samples 1 and 2, the Elevation/Loading I correlations were moderate and negative in direction (i.e., -.40 and -.38, respectively). This suggested that as the heights of the item profiles decreased, Coping Propensity tended to increase.

The Elevation/Loading II correlations for both Samples 1 and 2 also were moderate and negative in direction (i.e., -.46, -.35). Given that high Ratios in Modal Profile II appeared to be associated with high Coping Propensity (i.e., see MPII+), this relationship also was in the expected direction. Interestingly, these correlations are supportive of some of the conjectures that were raised in Study Two. For example, they lend support to the notion that the relative magnitudes of the Ratio components are of primary significance in this Modal Profile.

Canonical Correlation Analysis Between Factor Scores and Elevation and Loading Parameters

The correlations in Table 4-4 support the external validity of the

Modal Profiles derived in Study Two. They demonstrate that the elevation and shape parameters associated with each of the Modal Profiles exhibit expected relations with external validation variables. In the final phase of Study Three, a canonical correlation was performed between the factor scores and the Modal Profile parameters. The goal of this analysis was to determine the extent to which elevation and shape parameters linearly could be "explained" by the set of factor scores.

A test of the canonical omnibus no-relationship hypothesis based on three pairs of canonical variates indicated that the factor scores and Modal Profile elevation and shape parameters statistically were related (i,e., Wilks' Lambda(9, 97.5) = .3663, $\underline{p} < .01$ in Sample 1; Wilks' Lambda(9, 97.5) = .3273, $\underline{p} < .01$ in Sample 2)]. Sequential tests, based on Rao's $\underline{F}$ approximation (e.g., see Marascuilo & Levin, 1983) thus were conducted to determine how many canonical variate pairs reasonably could be retained. Results of this analysis, outlined in Table 4-5, supported the retention of one pair of canonical variates.

The structure coefficients, canonical correlations, and eigenvalues from the canonical analysis are outlined in Table 4-6. An examination of the structure coefficients associated with the first canonical X variates ($\underline{X}^{(1)}$) in Samples 1 and 2 indicate that they were highly and positively correlated ($\underline{r}$ = .681, .694, respectively) with original Factor Score 1 (representing effortful options associated with high psychological threat) and highly and negatively correlated ($\underline{r}$ = -.616, -.682) with original Factor Score 2 (representing low levels of perceived effectiveness and outcomes engendering little sense of control). Thus, the first canonical X variates, in general, appeared to represent constellations of factors mitigating coping behaviour.

The structure coefficients associated with the first canonical Y variates ($\underline{Y}^{(1)}$) in Samples 1 and 2 indicate that they were highly and positively correlated with the original Modal Profile elevation parameters ($\underline{r}$ = .873, .742, respectively) and highly and negatively correlated with the original Modal Profile I shape parameters ($\underline{r}$ = -

Table 4-5

Sequential Tests of Significance of Canonical Variate Pairs Based on Rao's F

	Wilks' Lambda	Approx. F	Num df	Den df	p
Sample 1					
1[a]	.3663	5.5349	9	97.5001	.0001
2[b]	.8697	1.4816	4	82	.2153
3[c]	.9677	1.4030	1	42	.2429
Sample 2					
1[a]	.3273	6.3086	9	97.5001	.0001
2[b]	.8866	1.2719	4	82	.2877
3[c]	.9921	.3352	1	42	.5657

[a] Ho: Lambda 1 = Lambda 2 = Lambda 3 = 0
[b] Ho: Lambda 2 = Lambda 3 = 0
[c] Ho: Lambda 3 = 0

Table 4-6

Structure Coefficients, Canonical Correlations, and Eigenvalues for The First Canonical Variate Pair From Samples 1 and 2

	Structure Coefficients							
	FSCR1	FSCR2	FSCR3	ELVN	LDI	LDII	R	EV
		$X^{(1)}$			$Y^{(1)}$			
Sample 1	.681	-.616	.395	.873	-.773	-.315	.761	.579
Sample 2	.694	-.682	.229	.742	-.888	-.147	.794	.631

R = Canonical Correlation
EV = Eigenvalue

.773, -.888). Thus, the first canonical Y variates, in general, appeared to represent highly stressful, low coping propensity items. Taking the first pair of canonical variates in each sample together, it may be stated that a linear composite dominated by factors mitigating coping behaviour accounted for approximately 58% and 63% percent of the variance, respectively, in a linear composite dominated by highly stressful, low coping propensity items.

Discussion

In general, the aforementioned analyses supported the validity of the derived Modal Profiles, and most particularly, the validity of model-congruent Modal Profile I. For example, as the shapes of the item profiles came to more closely resemble the shape of Modal Profile I, items concomitantly decreased in their tendencies to be associated with psychological self-threat. In addition, they increased in their tendencies to be associated with perceived effectiveness and feelings of perceived control. Given that Modal Profile I is a High Coping Propensity profile, these relationships are in the expected direction.

Furthermore, as the canonical correlation analysis suggested, a composite dominated by factors enhancing engagement in coping behaviour accounted for a substantial proportion of the variance in a composite dominated by relatively low stress, high coping propensity items. Previously, these coping enhancement factors were postulated to be characteristic of MPI+ items on rational grounds only.

In contrast to Modal Profile I, Modal Profile II appeared to be consistently associated only with Sample 1 and 2 elevation parameters. Although there was a suggestion that nonpsychological threat also may have been related to this profile, this relationship did not hold up across the two subject samples.

As was stated earlier, the Elevation/Loading II correlations seemed to provide additional evidence that the magnitudes of the model-relevant components were of primary significance in the interpretation of Modal Profile II. However, before such a conclusion firmly could be drawn, an attempt had to be made to derive similar configurations using independent samples and methods. It was the purpose of Study Four to evaluate the validity of the choice/control model using multiple response levels in a laboratory environment.

CHAPTER 5. STUDY FOUR

Although the results of the first three studies clearly engendered some support for the validity of the choice/control model, the fact that they relied primarily on self-report data placed clear limitations on the generalizability of their findings. Thus, the fourth, and final, study in the present series was designed to complement the first three investigations by assessing the validity of the choice/control model in a more elaborate laboratory context. The specific intent of Study Four was to determine whether previously presented model-congruent and incongruent findings could be replicated in a more "in vivo" context.

In contrast to Study One, Study Four involved the assessment of model-relevant parameters at the self-report, physiological, and behavioural levels. This was in response to the consensus that stress responses involve the often nonsynchronous operation of each of these three separate systems (e.g., see Eysenck, 1989). Furthermore, it examined reactivity that was elicited by the potential occurrence of an actual aversive event, versus reactivity that was elicited only imaginally. As was stated previously, subjects may have difficulty veridically imagining themselves, or their reactivity, in purely descriptive or imaginal situations (e.g., see Andrasik et al., 1980; Hodgson & Rachman, 1974). Finally, Study Four provided subjects with trial-by-trial opportunities to engage in actual, counterstress activities. Thus, in contrast to Study One, it allowed for a determination of the nature of the link between reported coping inclinations and actual coping behaviour.

Although any number of stressors could have been selected for use in the laboratory study, threat of white noise stimulation was selected for at least three reasons. First, in previous investigations of the influence of anticipatory threat on autonomic responding, white noise bursts have been shown to be subjectively aversive, as well as physiologically disruptive (e.g., see Lefave & Neufeld, 1980). Second, white noise has been used extensively in past investigations of stress, thus providing considerable precedent of satisfactory use of this stimulus. Finally, in the anticipatory phase, white noise has been shown to be associated with increased heart rate reactivity (e.g., Epstein & Clarke, 1970) increased skin conductance reactivity (e.g., Epstein & Clarke, 1970; Rockstroh, Elbert, Lutzenberger, & Birbaumer, 1979; Waid, 1979) and increased muscle tension reactivity (e.g., Rockstroh et al., 1979). As both this stress-transaction phase and these three physiological parameters were of interest in the present work, white noise seemed especially useful as a potential stressor.

The psychophysiological parameters selected for measurement in this study were heart rate, skin conductance, and frontalis muscle tension. These constitute the most frequently utilized psychophysiological indicators of stress activation in the extant stress literature, and are those for which the effects of noise most frequently have been established. The measurement of heart rate was separated into two distinguishable components - namely, heart rate acceleration and heart rate deceleration. Phasic fluctuations in these components previously have been demonstrated in situations of threat (e.g., see Deane, 1969; Dronsejko, 1972) and have been proposed to be reflective of different stress-relevant responses. For example, heart rate acceleration frequently has been interpreted as being reflective of the arousal response to threat. Furthermore, sympathetically mediated accelerative responses particularly have been proposed to occur in conditions requiring an active coping response (Obrist, 1981). In contrast, heart rate deceleration has been associated with attention-demanding orienting responses (Smith & Strawbridge, 1969), information intake (Blaylock, 1972), and low physical movement (Obrist, 1981). Thus, separate measurement of these components may allow for the provision of different information about the nature of the arousal response.

Procedurally, Study Four was run in two, separate phases. The first phase was approximately 35 minutes in duration, while the second phase (excluding a 5-minute break) was approximately 45 minutes in duration. During Phase 1 of the study, subjects were required to learn the probabilities of noise associated with eight different alphabetic letters. This learning took place in the context of Estes' (1976) categorical memory paradigm, to be elaborated upon further below. During Phase 2 of the study, the acquired probability information entered into subjects' decisions regarding counterstress activity. During this phase of the study, assessments were made of the stress response at the cognitive, psychophysiological, and behavioural levels.

A Note on the Acquisition of Stress-Relevant Probability Information

As has been mentioned previously, contingency assessments form an integral part of the decision to engage in counterstress behaviour (e.g., see Fisher, 1986; Neufeld, 1982; Neufeld & Paterson, 1989). Contingency assessments, in turn, have been demonstrated to be based on subjective probability estimates which clearly are prone to distortion (e.g., see Abelson & Levi, 1985; Fisher, 1986; Hogarth, 1987). For example, contingency assessments have been shown to be based on relative frequencies of event occurrences, as opposed to statistically correct conditional probability information. This tendency especially has been the case when probability information has been learned intermittently over extended periods of time. In a study by Ward and Jenkins (1965), it was demonstrated that when probability-relevant information was dispensed on a trial-by-trial basis, only 17% of subjects followed what Ward and Jenkins (1964) referred to as a "logically defensible learning rule". However, when information, instead, was dispensed in summary form, 75% of subjects adopted a logical learning style. The authors thus concluded that judges find it difficult to evolve logical rules when required to summarize probability information over trials.

The aforementioned findings regarding the episodic acquisition of probability information are of particular relevance to the negotiation of counterstress behaviour. Specifically, episodic learning comprises the manner in which we are required to incorporate probability information as we come across it during stressful circumstances in life. Thus, in order to enhance the ecological validity of probability learning processes relevant to the acquisition of stress-relevant probability information, it is important to incorporate learning paradigms into experimental studies which acknowledge this pattern of learning. In addition, it is important to incorporate paradigms which empirically have been verified to render frequently observed discrepancies between subjective and objective probability estimates. A paradigm which successfully appears to capture each of the latter features is Estes' (1976) categorical frequency memory model of prediction. Because of its relevance to the present laboratory study, it will be elaborated upon briefly below.

Estes' Categorical Frequency Memory Model of Prediction

Within the context of Estes' (1976) categorical frequency memory model of prediction, emphasis is placed on two cognitive components of subjective probability judgments. These include: (a) the manner in which judges arrange relative frequencies of event types or categories (e.g., wins, losses) in memory; and (b) the manner in which memorial representations of these frequencies are utilized in later predictive judgments.

Studies within the Estes paradigm generally proceed according to two separate stages. In the first, or "learning trial" stage, subjects are presented with pairs of letter stimuli which purportedly are representative of two different "competitors" (e.g., two political candidates, two commercial products, etc.). In each presentation, a marker is used to indicate that one item in the letter pair is preferred over the other. After numerous presentations of these learning trial pairs, the "judgment trial" stage of the paradigm begins. Here, subjects are presented with slightly different pairings of the original items, and asked to predict which member of the item pair would be the "winner".

Two important characteristics of Estes paradigm learning trials should be noted. First, some of the items in the original item set are presented more frequently than others. Such unequal frequencies allow for independence of win and loss outcomes, as well as at least partial independence of wins and losses from contingent probabilities (e.g., the proportions of item occurrences that are "wins"). Second, because letters of the alphabet are used to represent hypothetical competitors, the objects of judgment are deemed to be "content free". Thus, the role of categorical memory in the formulation of predictive judgments is examined free from the influence of object characteristics.

Findings regarding the learning of subjective probability information within the Estes' paradigm can best be illustrated by example. Assume that during a set of learning trials, the letter "A" is presented 20 times with a win/loss ratio of 8:12, and the letter "B" is presented seven times with a win/loss ratio of 5:2. If the letters "A" and "B" later are presented together during subsequent judgment trials, use of statistically correct contingent probability information (i.e., the win/loss ratio) suggests that the predicted winner in this pairing should be the letter "B". However, according to findings acquired from numerous Estes paradigm judgment trials, the most consistently predicted winner in this pairing is the letter "A".

According to Estes (1976), the aforementioned findings originate from the fact that subjects base their subjective probability predictions not on statistically correct probability information, but rather, on the scanning of relative frequencies of event representations in memory. Thus, since, in the aforementioned example, "A" has the highest frequency of win occurrences in the pair (i.e., eight versus five), it consistently emerges as the predicted winner, even though the statistically correct contingent probability information clearly would suggest otherwise.

Of relevance to the present dissertation is the observation that findings from the associative memory model paradigm have been extended to the domain of stress-relevant behaviour. In their study of the acquisition of probabilities in anticipatory appraisals of stress, Neufeld and Herzog (1983) noted that the construction of subjective probabilities largely was based on cumulative frequencies of aversive event outcomes (see also, Morrison et al., 1988; Mothersill & Neufeld, 1985). Of particular significance is the robust and consistent replication of these categorical-frequency findings, despite certain paradigmatic modifications (e.g., see Neufeld, 1982; Neufeld & Herzog, 1983).

One of the implications of the aforementioned findings for the study of stress-relevant behaviour is that often assumed congruences between subjective and objective probabilities (e.g., Miller & Grant, 1979) cannot be considered tenable. The clear lack of isomorphism between the two sets of probabilities must be acknowledged at both the theoretical and methodological levels. For this reason, the present laboratory study incorporated a validated modification of the Estes paradigm into its probability learning component.

Method

Subjects

A total of 60 subjects (30 males, 30 females) from the University of Western Ontario Summer Subject Pool participated in the laboratory study. Subjects were run individually, and received a remuneration of $20 for their participation in the two-hour session. Prior to engaging in the study, subjects were presented with a sample of the 1-second, 100 db burst of white noise that they were going to hear during the remainder of the study. They were told that the noise would never be louder or longer than the sample, and that they were free to withdraw from the study at any time. Subjects who indicated a desire to participate in the experiment subsequent to hearing the noise were asked to fill out a form of consent. Subjects who found the noise too aversive (one male, one female) were thanked for their participation and permitted to leave.

Phase 1: Apparatus and Procedure

Both Phase 1 (the learning of probability information) and Phase 2 (the utilization of probability information to make coping decisions) were conducted in a two-room laboratory. One room of the laboratory was occupied by the subject, and contained a reclining chair (fixed in an upright position), an eye-level computer monitor situated approximately 1-1/2 feet from the edge of the chair, and an additional table provided for filling out forms and containing other laboratory equipment. The second room in the laboratory was occupied by the experimente and contained a Grass Model 7D polygraph and two microcomputers which controlled both the presentation and scoring of experimental stimuli and data.

Learning Trials: Stimuli for the Phase 1 Learning Trials consisted of eight alphabetic letters (J,L,M,A,Z,V,P,G) which were derived from "confusion matrix" data on the basis of their maximum distinctiveness (Townsend, 1971). As per the modified Estes paradigm (e.g., see Neufeld & Herzog, 1983) each letter was paired with two categorical outcomes, namely, noise or light. Noise bursts were delivered through a set of stereo headphones, while light outcomes were delivered by the illumination of a 40-watt green light bulb to the right of the computer screen. A total of 85 letter-outcome exposures were presented to subjects during each learning trial, with the assigned frequencies of letter occurrence and probabilities of noise and light outcomes following those outlined in Table 5-1. In accordance with the Estes (1976) paradigm, frequencies of letter presentations were varied independently with noise and light outcomes. Each subject received one of three possible random orderings of the 85 letter-outcome pairs (refer to Appendix K) in each of the two learning trials in which they participated.

The instructions for the Learning Trials, which better elucidate the actual procedure for this stage of Phase 1, were as follows:

> In the first part of this experiment, you are going to be presented with eight alphabetic letters. These letters will be

Table 5-1

Probabilities and Frequencies of Stimulus Presentation for the Estes Paradigm Learning Trials

Letter Stimulus	J	L	M	P	A	Z	V	G
Contingent Probability of Noise	.11	.40	.22	.44	.67	.42	.64	.69
Stimulus Frequency	9	5	9	18	6	14	11	13
Frequency of Noise	1	2	2	8	4	6	7	9
Frequency of Light	8	3	7	10	2	8	4	4
Subjective Probability of Noise[a]	.30	.41	.43	.51	.57	.57	.62	.69

[a]Based on means of learned probability values collapsed across subjects and trials (see "Results").

Note: $r_{Noise-Light} = .06$

shown over and over again, in different orders, on the computer screen in front of you. After each letter is presented to you on the screen, you will hear either a loud noise through your stereo headphones, or, you will see a green light illuminate to the right of the computer screen. When the noise or light occurs, you are to pronounce, out loud, the letter that was just on the screen and the outcome (i.e., noise or light) that occurred just after the letter appeared.

So, if the letter "H" appeared on the screen, and immediately was followed by light, you would say "H-light". Similarly, if the letter "T" appeared on the screen, and was followed by noise, you would say "T-noise". Do you have any questions?

After each outcome has occurred, and you have pronounced the letter-outcome association out loud, the next letter immediately will appear on the screen, and the sequence will begin again. Thus, it is important to continually keep your eyes on the computer screen so that you don't miss any of the letters. Each of the letters will appear a different number of times, and will always be followed by either noise or light.

It is important to note that the same letter will not always be followed by the same outcome. That is, on some occasions, the letter "H" may be followed by noise, and on other occasions it may be followed by light. However, each letter will have either noise or light outcomes follow it more or less often. Thus, while the letter "H" will be followed by both light and noise, it will be followed by noise more often than light or light more often than noise. Your task is to try to remember the extent to which each letter is usually followed by either noise or light, or, to learn what the probability is that a specific letter will be followed by noise or light. Later on, you will be asked to make judgments about the probabilities of these outcomes, but for now, you simply need to watch, and pronounce out loud, the letter-outcome associations in order to try to learn them. Do you have any questions?

A schematic diagram of the Phase 1 Learning Trials is presented in Figure 5-1, outlining the durations of stimulus and noise/light presentations.

Judgment Trials: Following each of the two 85 letter-outcome pair Learning Trials, subjects were required to estimate the subjective probabilities of noise for each of the eight original letters. During the Judgment Trials, each of the eight letters was presented to subjects on the computer screen, one at a time, for 2 seconds each. After the letter disappeared from the screen, subjects were given 5 seconds to judge the probability of noise associated with the presented letter. Judgments were made by marking vertical slashes on 100 mm lines, each of which was marked with anchors of 0, 25, 50, 75, and 100 percent. Letters were presented to subjects in one of three random orders

Letter 1 on screen for 02 seconds	→	03 sec	→	Noise or Light for 01 second	→	04 sec interval	→
Letter 2 on screen for 02 seconds	→	03 sec	→	Noise or Light for 01 second	→	04 sec interval	→
Letter 3 on screen for 02 seconds	→	03 sec	→	Noise or Light for 01 second	→	04 sec interval	→
.							
.							
.							
Letter 85 on screen for 02 seconds	→	03 sec	→	Noise or Light for 01 second	→	04 sec interval	→

Total = 85 letter exposures
39 noise outcomes
46 light outcomes

Figure 5-1. Schematic diagram of Phase 1 Learning Trials outlined in Appendix L. Examples of Judgment Trial rating scales and a schematic diagram of the Phase 1 Judgment Trials are outlined in Appendix M and Figure 5-2, respectively.

The instructions for the Judgment Trials were as follows:

> Now it is time to use the information that you learned in the Learning Trials. In this set of trials, each of the eight letters from the previous set of trials is again going to be presented on the computer screen one at a time. Each letter will be presented only one time, and will not be followed by noise or light outcomes. After each letter is presented, I would like you first to write it down to the left of the rating scale. Then, I would like you to indicate how probable you think it is that noise would follow that letter. To make your probability ratings, simply place a vertical pencil slash at any point along this 100-point scale. Zero and 100 indicate the lowest and highest probabilities of noise, respectively, while 25, 50, and 75 indicate points in between. It is important to note that you are not limited to making your ratings at the five points marked on the scale. Rather, you can make your ratings at any point along the scale, using the markers as your guides. Do you have any questions?
>
> You will only be given 5 seconds to respond to each letter, so please make your judgments as quickly as you can. Once you have completed your ratings, be sure to look back up at the computer screen, so that you don't miss the next letter in the series. Please give a rating to every letter that appears, and do not leave any rating lines blank. If you are unsure of the probability associated with a certain letter, just make the best guess that you can.
>
> Are there any questions?

The end of the second Judgment Trial marked the end of Phase 1, and of the learning of the probability information. Each subject was given a five-minute rest prior to the beginning of Phase 2.

Phase 2: Apparatus and Procedure

As a first step in Phase 2, the electrodes were attached to each subject in preparation for the collection of psychophysiological data. Subsequent to the attachment of the electrodes, subjects were asked to rest quietly for a period of 5 minutes, during which time the experimenter calibrated the polygraph and recorded 30 second, pre-experimental baseline measures of heart rate, skin resistance, and frontalis muscle tension. All psychophysiological signals were monitored using a Grass Model 7D polygraph, and were transduced via Sensormedics 16mm surface electrodes and Teca electrolyte transmission

Letter 1 on screen for 02 seconds	→	01 sec	→	Probability Judgment for 05 seconds	→
Letter 2 on screen for 02 seconds	→	01 sec	→	Probability Judgment for 05 seconds	→
Letter 3 on screen for 02 seconds	→	01 sec	→	Probability Judgment for 05 seconds	→
.					
.					
.					
Letter 8 on screen for 02 seconds	→	01 sec	→	Probability Judgment for 05 seconds	→

Total of 8 Letter Stimuli

Figure 5-2. Schematic diagram of Phase 1 Judgment Trials gel.

Heart rate was monitored using a Model 7P4 Tachograph pre-amplifier. In order to record heart rate (both acceleration and deceleration), one electrode was attached to the inside of the subject's nondominant forearm, and one was attached to the calf of the leg, approximately 6 inches below the knee. Heart rate acceleration and deceleration were scored as the fastest and slowest beats, respectively, for the response durations of interest. More specifically, ranges of cardiac activity were measured by assessing the "least upper bound" and "greatest lower bound" in each of the 5-second response epochs (e.g., see Mothersill, Dobson, & Neufeld, 1985).

Skin resistance was recorded using a Model 7P1E low-level DC preamplifier. Electrodes were placed on the medial phalanges of the fore and middle fingers of the subject's nondominant hand, as this site previously has been associated with low levels of scarring and electrode movement (e.g., see Venables & Christie, 1980). Although signals originally were recorded as units of minimum skin resistance, they later were converted to units of maximum skin conductance via the formula:

$$(1/\text{resistance in ohms}) \times 10^6.$$

Frontalis muscle tension was recorded using a Model 7P3B wide-band AC preamplifier and integrator. Electrodes were placed approximately halfway between each eyebrow and the subject's hairline, and muscle tension was recorded as the average .2-second integrated microvolt activity. A ground clip also was attached to the lobe of the left ear and connected to each of the polygraph channels.

Subsequent to the attachment of the electrodes and the calibration of the polygraph, a board to which an electronic rating scale and a telegraph key were attached, was placed across the arms of the reclining chair in front of the subject. The telegraph key and the electronic slider were placed vertical to one another on the equipment board, so that both easily could be accessed by both right and left-handed subjects.

After placement of the equipment board, the Phase 2 instructions were presented to the subjects. Although these instructions led subjects to believe that they could receive bursts of loud noise during Phase 2, the electronic equipment was wired such that no bursts ever would actually occur. Instructions were delivered verbally, while referring to an outline of a typical Phase 2 trial, depicted in Figure 5-3. The procedure for Phase 2 may best be understood by referring to the following instructions and the diagram in Figure 5-3.

> In the following sets of trials, you are again going to be presented with the letters from the previous sets of trials. And, as was the case in the Learning Trials, there is again going to be the possibility that each letter will be followed by loud noise. This time, however, the noise is not going to occur immediately after the presentation of the letter. Instead, if it is going to occur, it will occur at a later point in the trial between the words "Go" and "Stop". You can see the Go-Stop period to which I am referring outlined on this schematic drawing.
>
> The probability of noise occurring during the Go-Stop period will be the same as the probability of noise associated with the letter at the beginning of the trial. Thus, if the letter "K" was presented at the beginning of a trial, and you had learned that it was associated with noise 75% of the time, you would immediately know that there was a 75% chance of noise during the Go-Stop period. Thus, in general, the letters at the beginning of each trial are going to act as sources of information about the possible events to come. That is why it was so important to learn the probabilities of noise during the previous Learning Trials.
>
> The following trials differ in one important respect from the original learning trials. That is, this time, you will potentially be able to prevent that noise from occurring by tapping on the telegraph key in front of you. Specifically, you will be able to prevent the noise from occurring if you can tap the key 20 times in a period of 4 seconds. The taps must be completed in 4 seconds, as the 5th second must be left available for potential delivery of the burst of noise. If you tap less than 20 times, or if you do not tap at all, the probability of noise will remain at its original value. In other words, the counter in the computer will not recognize the noise switch as being off, and thus, you won't have changed any of the original conditions at all. Try the key now so that you get a feel for what you will have to do to prevent the noise from occurring.
>
> Now, let's refer to the schematic diagram of a trial, and go over each of the steps in sequence.
>
> After the "Ready" signal, which signifies the beginning of a trial, a letter will appear on your computer screen. After seeing the letter, remind yourself of the probability of noise associated with it, as this is the same probability with which noise will occur during that trial's "Go-Stop" period.
>
> After the letter disappears, you will be asked to respond to four different questions, which will be presented one at a time

READY

↓

Letter → Indicates probability of noise during Go-Stop period

↓

Question 1

↓

Question 2

↓

Question 3

↓

Question 4

↓

READY TO TAP

↓

GO

→→→→→→→ Noise may occur during this 5-second interval

STOP

Figure 5-3. Schematic diagram of stages of a Phase 2 trial.

on the computer screen. The ratings for these questions will be made on a 100-point scale, as they were during the Judgment Trials. This time, however, they will be made using the slider that is positioned above the telegraph key. In order to make your rating, simply move the slider to the desired position, and enter your rating by pressing the black button.

Each of the four questions will pertain to the upcoming Go-Stop period during which noise may potentially occur. Remember, try to consider all of the information that you have when you are making each of your responses.

The first question will read as follows:

All things considered, how much stress do you think you will feel if you do engage in active tapping?

This is the same as asking you how much stress you will feel if you engage in the available coping response.

The second question will be:

All things considered, how much stress do you think you will feel if you do not engage in active tapping?

This is like asking you how much stress you will feel if you do nothing to prevent the noise at all.

The third question will be:

All things considered, how motivated do you feel to engage in active tapping?

This is like asking you how willing or prepared you feel to engage in the available coping response.

The fourth question will be:

All things considered, how tense do you feel when you think of the upcoming Go-Stop period?

Base your answer to this question on everything you know at the time the question is presented.

After you have completed the four ratings, a "Ready to Tap" sign will appear on the screen. When you see this prompt, place your fingers on the telegraph key, but do not begin tapping yet. When you see the word "Go", begin tapping, if you wish, and when you see the word "Stop", stop tapping, if you haven't already done so by then.

Before beginning the trials proper, I will show you printed replicas of the images that you will see on the computer screen, and briefly run through the instructions again. Then, we will conduct three practice trials using "dummy" letters on the computer screen, and practice using the tapping and rating equipment. When you are ready, we will begin the trials proper, using the letters you have previously seen.

The printed replicas of the images that were presented on the computer screen are outlined in Appendix N. A schematic diagram of a Phase 2 trial, including events recorded and interval durations, is outlined in Figure 5-4.

<u>A Note on the Determination of the Experimental "Coping" Response</u>. In the laboratory study, the determination of an appropriate coping response (i.e., tapping 20 times in 4 seconds) evolved as result of a number of pilot trials using different forms of the tapping measure. Each of these pilot trials highlighted certain difficulties with the tapping responses being tested, and eventually, led to the determination of a response that had certain desired stress-relevant characteristics (i.e., moderate difficulty level, potential for successful execution, and a relatively high "motivational" quality) and to a tapping response which was relatively independent of certain predictive model-relevant parameters.

In an initial pilot test, subjects were told that each tap of the telegraph key (which in this instance, was very easy to press) would reduce the original probability of noise by 5%. Thus, if the original probability of noise was 100%, subjects knew that they could, with certainty, reduce the probability of noise to zero by tapping the telegraph key 20 times during the Go-Stop interval. Although this response was characterized by a relatively high motivational quality and the potential for successful execution, it also presented two potential problems. First, the difficulty and potential effectiveness of the tapping response varied as a function of the probability of noise associated with the letter stimuli. That is, the response was much more difficult, and thus, potentially much less effective, for higher probability of noise letters than it was for lower probability of noise letters. Although one could argue that higher stress situations often require more difficult coping strategies, the exigencies of the laboratory setting suggest that the meaning of laboratory results is easier to infer when all but the focal variables of interest are held constant. In the case of the tapping task, this suggested that the tapping response had to be equally effective and equally difficult across all probability of noise levels.

Prior to Initiation of Trials:

30 sec "pre-experimental" physiological recording interval - EKG, EMG, GSR

Typical Trial:

05 sec	→	Ready	→	Letter on	→	05 sec	→	Ratings	→	10 sec →
↓				screen for		↓		(1-4)		↓
EKG				02 sec		EKG		[E(S)¦CA]		EKG
EMG						EMG		[E(S)¦NCA]		EMG (for
GSR						GSR		CP		GSR 05 sec)
								SA		

Ready to	→	05 sec	→	GO	→	05 sec	→	STOP	→	05 sec	→	30 sec
Tap		↓				↓				↓		interval
		EKG				# Taps				EKG		
		EMG				RT				EMG		
		GSR								GSR		

Figure 5-4: Schematic diagram of Phase 2 trial events and stimulus/recording durations.

Second, and perhaps more importantly, the tapping response in this case clearly was not eliciting a behavioural indicator of coping propensity that was independent of the values of the Numerator and Denominator cost of coping Ratio components. That is, the number of taps required for successful prevention of stressor onset clearly was a function of the probability of noise, and thus, varied systematically with the size of the Denominator of the cost of coping Ratio. In addition, the tapping task in this instance also may have systematically influenced the value of the Numerator component of the cost of coping Ratio, as the Numerator component also potentially encompasses degree of coping effort (e.g., see Neufeld & Paterson, 1989). Thus, use of this form of the tapping task clearly would have resulted in a situation where coping propensity (at least as measured behaviourally) would have varied systematically with the cost of coping Ratio, not because of stress-relevant cognitive and decisional considerations, but rather, because of the nature of the tapping instructions themselves. Testing of this particular tapping task indicated then, that independence of the Numerator and Denominator values from the behavioural indicator of coping propensity also was required for valid assessment of the tenability of the choice/control model.

In a second series of pilot trials, the required qualities of the coping task outlined above (i.e., constant potential effectiveness and difficulty and independence from Numerator and Denominator values) were evoked by requiring a constant number of taps (15) to prevent stimulus onset, regardless of the probability of stressor occurrence. Three attempts also were made to increase the difficulty of the coping response by: (a) requiring subjects to tap the telegraph key with their nondc .nant hand; (b) requiring subjects to tap the key with the foreknuckle of their dominant index finger (a slightly painful task); and (c) greasing the telegraph key to make execution of the tapping response very difficult. Each of these separate efforts to enhance difficulty of the coping task also posed certain problems. For example, tapping with the nondominant hand resulted in a level of bodily movement which jeopardized the integrity of the psychophysiological data, tapping with the foreknuckle proved to be painful enough to be ethically suspect, and greasing the telegraph key resulted in excessive levels of frustration and difficulties keeping the telegraph key consistently greased. Thus, a decision finally was made to increase difficulty by increasing the force required to press the telegraph key, and to require subjects to execute 20 taps in 4 seconds with their dominant hand. This final coping response had the desired properties of moderate difficulty level, potential for successful execution, a relatively high "motivational" quality, and independence of resulting behavioural data from Numerator and Denominator cost of coping Ratio values. In addition, it was associated with relatively low levels of movement, thus contributing to the integrity of the psychophysiological data.

Practice and Experimental Trials: During the three practice trials, which occurred immediately prior to the experimental trials, subjects were given probability of noise estimates by the experimenter after presentation of each of the "dummy" letters. They then were asked to respond as if in an actual trial, using the slider and telegraph key equipment. Subjects were told that they would not receive noise bursts during any of the practice trials, but nonetheless, were asked to respond according to the delivered probabilities. Each subject was allowed to reach the 20-tap criterion at least once during the practice trials in order to reduce potential learning effects during the experimental trials proper.

During the final experimental trials, subjects received one of three random orderings of the original eight letter stimuli. The only stipulation was that an equal number of males and females had to receive each random order. In addition to the eight letter stimuli, subjects also were presented with two novel letters ("R" and "S"), which they were asked to identify subsequent to the completion of the experimental trials. These novel letters were used to determine whether subjects were paying attention during the original learning trials, and to determine how they would respond to stimuli for which they had no probability information. Subjects who were unable to identify at least one of the two the novel stimuli (one male) were deleted and later replaced. The three random orderings of the 10 experimental stimuli are outlined in Appendix O.

Subsequent to the completion of the experimental trials, subjects were asked to rate, on a 100-point scale: (a) how much control they felt they had during the experimental trials and (b) how much control they felt other subjects had during the experimental trials. These ratings, which were designed to act as "manipulation checks", were used to assess the extent to which subjects believed that noise stimuli actually were going to occur, and the extent to which they felt they actually were instrumental in preventing the noise from occurring. Subsequent to these ratings, subjects were unhooked from the equipment, and presented with a debriefing talk.

Results

The laboratory study analyses were separated according to the phase during which they were conducted and the questions they were intended to answer. Thus, the Phase 1 Learning and Judgment trial analyses were devoted to determining whether subjects learned probability of noise information, and whether there were any unexpected or undesired influences on the learning of this information. Phase 2 preliminary experimental trial analyses were devoted to examining the success of instructional manipulations, potentially important trends in psychophysiological reactivity, and the potency of experimental letter stimuli. Finally, the Phase 2 hypothesis-relevant analyses were conducted to assess the tenability of the choice/control model itself. Results pertinent to each of these analytic phases will be presented below, in turn.

Phase 1 - Learning and Judgment Trial Analyses

Influence of Learning Trial/Judgment Trial Order on Noise

Probability Judgments. In order to determine whether subjects learned distinctions between the noise probabilities associated with the eight letter stimuli, and whether order of learning and/or order of presentation during the Judgment Trials affected these probability judgments, two 3(Order) x 2(Sex) x 2(Trial) x 8(Letter) split-plot factorial analyses of variance (with repeated measures on Trial and Letter) were performed. The first of these analyses used the order of letter presentation during the Learning Trials as the Order factor, while the second used the order of letter presentation during the Judgment Trials as the Order factor. Results of these analyses are presented in the ANOVA summary tables outlined in Tables 5-2 and 5-3, respectively.

As is indicated by both Tables 5-2 and 5-3, there were significant main effects for Letters in both analyses (Learning: $F(7,378) = 28.23$, $p < .01$; Judgment: $F(7,378) = 27.81$, $p < .01$), suggesting that subjects did learn distinctions between the noise probabilities associated with the eight alphabetic letters. In addition, the absence of main effects for both Learning and Judgment Trial Orders suggested that the learning and judgment of this probability information was not affected by either order of letter presentation during the Learning Trials or order of letter presentation during the Judgment Trials. The patterns of subjective noise probabilities, collapsed across both subjects and trials, are represented graphically in Figure 5-5.

Influence of Noise and Light Frequencies and Contingent Probabilities on the Probability Learning Process. Correlational analyses were conducted to determine the extent to which noise and light frequencies and contingent probabilities of noise influenced the probability learning process. First, zero order correlations were conducted between each of the three aforementioned stimulus properties (i.e., noise frequency, light frequency, and contingent probability) and the subjective probability judgments presented in Figure 5-5 (see also, Table 5-1). Then, because contingent probability values necessarily

Table 5-2

Analysis of Variance Summary Table for the Noise Probabilities Associated with the Eight Alphabetic Letters: "Order" Equals Learning Trial Order

Source	df	MS	F
Sex (A)	1	8.82	.01
Learning Trial Order (B)	2	762.15	1.20
A x B	2	593.72	.93
Within Cells	54	636.23	
Trial (C)	[illegible]	54.15	.24
A x C	1	51.34	.22
B x C	2	343.96	1.51
A x B x C	2	271.21	1.19
Within Cells	54	228.52	
Letter (D)[a]	7	19674.57	28.23**
A x D	7	494.46	.71
B x D	14	668.01	.96
A x B x D	14	754.57	1.08
Within Cells	378	697.01	
C x D[b]	6.71	457.73	2.02
A x C x D	6.71	161.73	.72
B x C x D	13.42	196.34	.87
A x B x C x D	13.42	206.10	.91
Within Cells	362.24	226.11	

** $p < .01$

[a]Huynh-Feldt ϵ for tests involving "Letter" (D) within-subjects effect = 1.000

[b]Huynh-Feldt ϵ for tests involving "Trial x Letter" (C x D) within-subjects effect = .9583

Table 5-3

Analysis of Variance Summary Table for the Noise Probabilities Associated with the Eight Alphabetic Letters: "Order" Equals Judgment Trial Order

Source	df	MS	F
Sex (A)	1	8.82	.01
Judgment Trial Order (B)	2	1516.46	2.51
A x B	2	712.66	1.18
Within Cells	54	603.89	
Trial (C)	1	54.15	.22
A x C	1	51.34	.21
B x C	2	49.24	.20
A x B x C	2	164.87	.68
Within Cells	54	243.38	
Letter (D)[a]	7	19674.57	27.81**
A x D	7	494.46	.70
B x D	14	631.02	.89
A x B x D	14	508.59	.72
Within Cells	378	707.49	
C x D[b]	6.67	460.35	2.00
A x C x D	6.67	162.66	.71
B x C x D	13.33	211.30	.92
A x B x C x D	13.33	111.29	.48
Within Cells	359.94	230.61	

** $p < .01$

[a]Huynh-Feldt ϵ for tests involving "Letter" (D) within-subjects effect = 1.000

[b]Huynh-Feldt ϵ for tests involving "Trial x Letter" (C x D) within-subjects effect = .95221

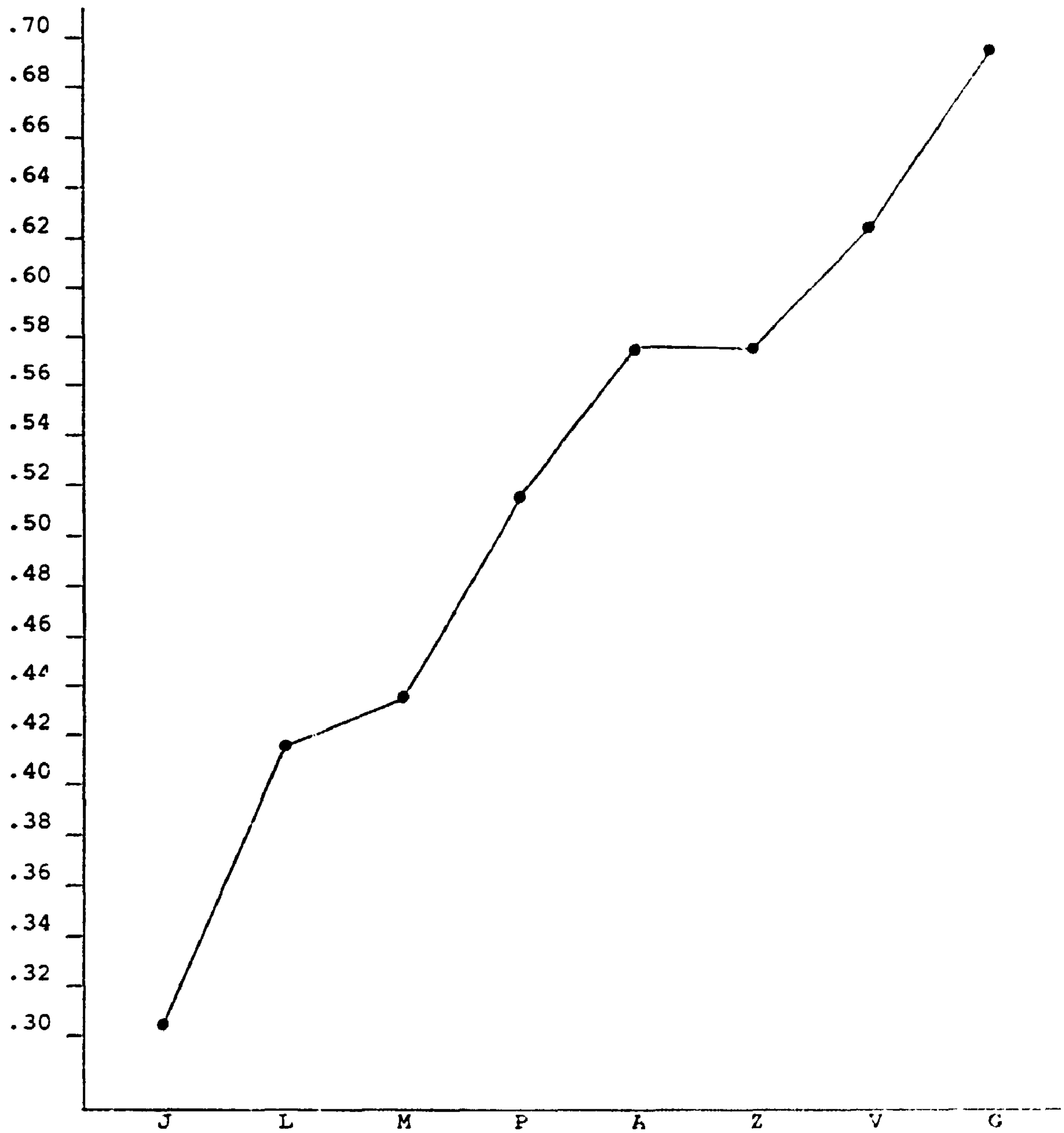


Figure 5-5. Probability of noise ratings for the eight letter stimuli.

were correlated with both the frequency of noise (r = .72) and the frequency of light (r = -.61), part correlations also were conducted to remove possibly confounding variance from these correlations. Thus, for each zero-order correlation computed, overlapping variation attributable to the influence of the two stimulus properties not under consideration systematically was partialled out of the stimulus property remaining under consideration. All full and part correlations are depicted in Table 5-4, which also outlines the correlational and control variables of interest.

As is indicated by Table 5-4, subjective probabilities of noise were most highly associated with contingent probabilities of noise (r = .91) and relative frequencies of noise (r = .86) when the effects of possibly confounding variables were not controlled for. The stimulus property with which the subjective probability estimates were least associated was relative frequency of light (r = -.35). When these zero order correlations were controlled for the possibly confounding influence of the remaining stimulus properties, the subjective probabilities of noise were most highly associated with the relative frequencies of noise (r = .70), as has consistently been found in both stress-relevant and non-stress-relevant Estes paradigms (e.g., see Estes, 1976; Mothersill & Neufeld, 1980; Neufeld & Herzog, 1983). In contrast, and also in keeping with previous studies, subjective probabilities of noise were almost entirely uncorrelated with relative light frequencies and contingent probabilities of noise (i.e., r = -.11 and -.01, respectively) when relevant correlations were controlled for the influence of possibly confounding variables.

Phase 2 - Preliminary Experimental Trial Analyses

Outlined in Figure 5-6 is a schematic representation of a typical Phase 2 trial. Unlike the schematic representation presented earlier (see Figure 5-4), this representation includes a labelling and description of the six potential psychophysiological recording intervals

Table 5-4

Zero-Order and Part Correlations Between Noise and Light Frequencies, Contingent Probabilities, and Subjective Probabilities for the Eight Letter Stimuli

Zero-Order Correlations	Part Correlations
r_{14} = .86	$r_{4(1.23)}$ = .70
r_{24} = -.35	$r_{4(2.13)}$ = -.11
r_{34} = .91	$r_{4(3.12)}$ = -.01

Note: 1 = frequency of noise
2 = frequency of light
3 = contingent probability of noise
4 = subjective probability of noise

<u>Prior to the Initiation of the Trials</u>:

(1) 30 sec "pre-experimental" physiological recording interval - EKG, EMG, GSR

<u>Typical Trial</u>:

05 sec	→	Ready	→	Letter on	→	05 sec	→	Ratings	→	10 sec →
↓				screen for		↓		(1-4)		↓
EKG				02 sec		EKG		[E(S)¦CA]		EKG
EMG						EMG		[E(S)¦NCA]		EMG (for
GSR						GSR		CP		GSR 05 sec)
								SA		
(2)						(3)				(4)

Ready to Tap	→	05 sec	→	GO	→	05 sec	→	STOP	→	05 sec	→	30 sec interval
		↓				↓				↓		
		EKG				# Taps				EKG		
		EMG				RT				EMG		
		GSR								GSR		
		(5)								(6)		

<u>Description of Psychophysiological Recording Intervals</u>

(1) <u>Pre-experimental Interval</u> - psychophysiological responses recorded during last 30 seconds of a 5-minute rest period, prior to the delivery of the Phase 2 instructions - a pre-experimental baseline

(2) <u>Pre-letter Interval</u> - psychophysiological responses recorded for 5 seconds prior to the delivery of the "Ready" signal indicating the beginning of a trial - a pre-trial baseline

(3) <u>Post-letter Interval</u> - psychophysiological responses recorded for 5 seconds subsequent to the delivery of the letter stimulus - subjects are aware of probability of noise at this point

(4) <u>Pre-ready Interval</u> - psychophysiological responses recorded for 5 seconds prior to the preparatory "Ready to Tap" signal - the first of two anticipatory stress arousal intervals

(5) <u>Post-ready Interval</u> - psychophysiological responses recorded for 5 seconds subsequent to presentation of "Ready to Tap" signal - the second of two anticipatory stress arousal intervals

(6) <u>Post-tapping Interval</u> - psychophysiological responses recorded for 5 seconds after the presentation of the "Stop" signal - a "post-impact" measure

<u>Figure 5-6</u>. Schematic diagram of Phase 2 trial events and stimulus/recording durations.

of interest. During the presentation of the Phase 2 results, the psychophysiological recording intervals under consideration will be referred to using the labels presented in Figure 5-6.

Assessment of Order Effects. Although order effects explicitly were tested for in Study One, and in Phase 1 of Study Four, they were not explicitly tested for during Phase 2 of the laboratory study, due to computational constraints. Tests for order effects in Phase 2 of the laboratory study required a highly complex statistical design. This design, which incorporated two between subjects factors (i.e., Order and Sex) and 15 dependent variables (see descriptions of the 15 laboratory response variables in "Phase 2 Hypothesis-Relevant Analyses" below) proved to exceed the memory capacity of available computer programs. The absence of such an analysis was not deemed problematic in Phase 2, however, as it previously has been demonstrated that a robust solution to order effects is to randomly assign subjects to experimental conditions (e.g., see Gaito, 1961). As was stated above, three random orders of stimulus presentation were used during Phase 2 of the laboratory study.

Assessment of Perceived Control During the Experimental Trials. Prior to engaging in the experimental analyses proper, it was deemed important, as a form of manipulation check, to determine the extent to which subjects believed they had control during the experimental trials. Thus, a 2(Sex) x 2(Control) split-plot factorial analysis of variance (with repeated measures on Control) was conducted, using the post-experimental control ratings as the dependent measure. These ratings assessed the amount of control subjects felt they and other subjects had during the experimental trials, measured on a 100-point scale. Means and standard deviations for the dependent variable are outlined in Table 5-5.

As is indicated by Table 5-5, subjects appeared to believe that they had a certain amount of control during the experimental trials. That is, they did not appear to be aware that there was never going to

Table 5-5

Means and Standard Deviations of Post-Experimental Control Ratings

	M	*SD*
Control Subjects Felt *They* Had:		
Males	67.681	33.882
Females	61.108	31.166
Total Sample	64.395	32.445
Control Subjects Felt *Other Subjects* Had:		
Males	63.736	32.500
Females	58.459	28.119
Total Sample	61.098	30.247

be any noise during the trials, thus suggesting that the Phase II instructional manipulations were successful.

Referring to Table 5-6, it can be seen that there was a main effect for Control in the split-plot analysis. This, in conjunction with the means in Table 5-5, suggests that subjects believed they had more control during the experimental trials than other subjects who participated in the experiment ($F(1,58) = 7.32$, $p < .01$). There were no significant sex differences on the perceived control variable, nor was there a Sex x Control interaction.

Pre-Experimental Sex Differences in Psychophysiological Indices of Stress Arousal: In order to determine whether there were sex differences in the Pre-experimental psychophysiological indices of stress arousal, a one-way, multivariate analysis of variance with one two-level factor (Sex) and four dependent variables (Skin Conductance, Heart Rate Deceleration, Heart Rate Acceleration, Muscle Tension) was conducted. Multivariate results indicated significant differences between males and females on the Pre-experimental psychophysiological indices [Wilk's Lambda(4,55) = .77953, $p < .01$]. Follow-up univariate tests indicated that males were significantly higher than females on Pre-experimental measures of skin conductance ($F(1,58) = 4.32$, $p < .05$). Further, they indicated that females were significantly higher than males on Pre-experimental measures of muscle tension ($F(1,58) = 9.98$, $p < .01$). Means and standard deviations of the Pre-experimental psychophysiological measures are outlined in Table 5-7. Follow-up univariate summary tables are outlined in Table 5-8.

Changes in Psychophysiological Stress Arousal Across Time: In order to determine whether there were changes in psychophysiological stress arousal over the course of the Phase 2 trials, mean values of the four Pre-letter psychophysiological indices, collapsed across subjects and presentation orders, were correlated with trial numbers. Pre-letter psychophysiological indices were selected for analysis as they essentially acted as consistent "pre-trial baselines" which were sampled

Table 5-6

Analysis of Variance Summary Table for Assessment of Perceived Control

Source	df	MS	*F*
Sex (A)	1	1053.1	.54
Within Cells	58	1938.57	
Control (B)	1	326.07	7.32**
A x B	1	12.59	.28
Within Cells	58	44.56	

** $p < .01$

Table 5-7

Means and Standard Deviations of the Pre-Experimental Physiological Indices of Stress Arousal

	Mean	Standard Deviation
Skin Conductance (micromhos)		
Males	7.402	5.038
Females	4.928	4.132
Heart Rate Minimum (bpm)		
Males	68.138	10.001
Females	66.756	12.313
Heart Rate Maximum (bpm)		
Males	85.000	11.944
Females	87.027	12.300
Muscle Tension (microvolts)		
Males	19.871	9.435
Females	32.869	20.462

Table 5-8

Univariate Summary Tables for the Pre-Experimental Physiological Indices of Stress Arousal

	MS(Sex)	MS(Error)	df	F	p
Skin Conductance (SC)	91.81358	21.23025	1,58	4.32	< .05
Heart Rate Deceleration (HRD)	28.62123	125.82064	1,58	.22	n.s.
Heart Rate Acceleration (HRA)	61.63094	146.97492	1,58	.42	n.s.
Muscle Tension (MT)	2534.35004	253.85968	1,58	9.98	< .01

prior to the presentation of the letter stimuli.

Table 5-9 outlines the correlations between the psychophysiological indices and the trial numbers. As is indicated by these correlations, Skin Conductance and Heart Rate Deceleration exhibited a tendency to increase across trials, while muscle tension, and to a lesser extent, heart rate acceleration, exhibited a tendency to decrease across trials. It should be noted that these correlations potentially are underestimates of the strength of the actual relationships, since collapsing across orders of presentation did not completely equalize the aversiveness associated with each trial number. That is, while presenting, and collapsing across, three random orders of stimulus presentation _helped_ to equalize the aversiveness associated with each trial, it did not equalize it to the extent that complete or more numerous randomizations may have. Thus, caution should be exercised in interpreting the absolute values of the Table 5-9 correlations.

Retention of Noise Probability Information: In order to determine whether subjects retained knowledge of the noise probabilities associated with the letter stimuli across experimental phases, learned subjective probabilities of noise from the Phase 1 Judgment Trials were correlated with Denominator [E(S)¦NCA] judgments from the Phase 2 experimental trials (see Figure 5-6). Because the Phase 1 Judgment Trials utilized only eight of the ten letter stimuli (i.e., "R" and "S" were presented only in the experimental trials), analyses were conducted on eight letters only. Results of this analysis, which was based on values collapsed across subjects, indicated an extremely high correlation between the Phase 1 and Phase 2 judgments ($\underline{r}$ = .96). Thus, it may be concluded that retention of probability information was extremely high across experimental phases.

Assessment of Relative Stressfulness of Experimental Letter Stimuli: In order to determine whether the letter stimuli were perceived as being differentially stressful during the Phase 2

Table 5-9

Correlations Between Pre-letter Psychophysiological Indices and Trial Numbers

Index	*r*
Skin Conductance	.78
Heart Rate Deceleration	.51
Heart Rate Acceleration	-.39
Muscle Tension	-.78

experimental trials, a 2(Sex) x 10(Letter) split-plot factorial analysis of variance (with repeated measures on Letters) was conducted on the Phase 2 Denominator [E(S)|NCA] judgments. The resulting ANOVA summary table is outlined in Table 5-10 and the means and standard deviations of the Denominator variable are outlined in Table 5-11.

As is indicated by Table 5-10, the split-plot analysis yielded a significant main effect for Sex ($F(1,58)=5.91$, $p < .05$). The Table 5-11 means indicate that males exhibited significantly greater Denominator judgments than females, thus suggesting that they tended to associate greater levels of stress expectancy with the letter stimuli.

In addition to a main effect for Sex, the split-plot analysis also yielded a main effect for Letters ($F(6.19, 358.75)=11.96$, $p < .01$). Because it was deemed important to determine which letters differed significantly from one another, the overall F-test was followed by 45 post hoc pairwise comparisons. In order to control the overall alpha level (.05), a Bonferroni correction was applied resulting in each test being conducted at .05/45=.001 level of significance. In a Monte Carlo study, Maxwell (1980) has determined that this is the most appropriate post hoc procedure when the repeated measures sphericity assumption is violated (see also, Stevens, 1986). Results of the post hoc analysis are outlined in Table 5-12 which indicates the letters that differ significantly from one another.

Assessment of Psychophysiological Responsivity to Experimental Stimuli: In order to determine whether subjects experienced any psychophysiological stress arousal reactions to the initial presentations of the letter stimuli, differences in psychophysiological reactivity between the Pre- and Post-Letter intervals were examined for Skin Conductance, Heart Rate Deceleration, Heart Rate Acceleration, and Muscle Tension, respectively. Two 2(Sex) x 2(Interval) x 10(Letter) split-plot factorial analyses of variance (with repeated measures on Interval and Letter) were conducted for each psychophysiological dependent measure. One analysis controlled for Pre-experimental

Table 5-10

ANOVA Summary Table for Assessment of Relative Stressfulness of Experimental Letter Stimuli

Source	df	MS	*F*
Sex (A)	1	11749.53	5.91*
Within Cells	58	1989.43	
Letter (B)[a]	6.19	10726.18	11.96**
A x B	6.19	370.66	.41
Within Cells	358.75	897.22	

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

[a] Huynh-Feldt ϵ for tests involving "Letter" (B) within-subjects effect = .68727

Table 5-11

Means and Standard Deviations of the Denominator Variable For the 10 Experimental Letter Stimuli

	Males		Females		Total Sample	
	M	*SD*	*M*	*SD*	*M*	*SD*
J	34.18	25.75	27.12	23.92	30.65	24.90
L	50.10	22.75	41.07	23.40	45.59	23.30
M	50.46	22.32	44.66	22.70	47.56	22.51
P	46.59	25.73	46.32	28.34	46.46	26.84
A	63.78	24.37	50.08	27.77	56.93	26.81
Z	59.16	24.38	49.54	33.45	54.35	29.42
V	70.24	22.06	61.21	29.70	65.72	26.33
G	73.24	20.95	60.21	28.69	66.73	25.76
R	46.87	34.51	39.52	32.92	43.20	33.64
S	49.45	34.43	35.85	33.62	42.65	34.42

Table 5-12

Pairwise Comparisons Between the 10 Experimental Letter Conditions

Means

J	S	R	L	P	M	Z	A	V	G
30.65	42.65	43.20	45.59	46.45	47.56	54.35	56.93	65.72	66.73

T-Values Resulting from Pairwise Comparisons of Means

	S	R	L	P	M	Z	A	V	G
J	-2.29	-2.34	-4.18*	-3.71*	-4.76*	-5.55*	-6.46*	-9.47*	-9.65*
S		0.18	0.65	0.63	0.92	1.97	2.76	4.18*	5.11*
R			0.52	0.56	0.83	2.04	2.53	4.09*	5.18*
L				-0.20	-0.60	-2.08	-2.83	-5.60*	-5.61*
P					0.27	1.76	2.45	4.49*	-4.41*
M						-1.57	-2.33	-4.84*	-5.08*
Z							0.56	-2.72	-2.96
A								-2.00	-2.77
V									-0.27

* indicates pairs that are significantly different at $p < .001$

baseline values of physiological reactivity, while the other involved analysis of unadjusted scores. Adjusted and unadjusted analyses were run to compensate for potential difficulties with covariance adjustments, to be elaborated upon briefly below.

A Side Note On Covariance Adjustments. When an extraneous variable systematically varies over levels of a focal independent variable, covariance adjustments frequently are used to "remove" the effects of the nuisance or extraneous variable. Although such approaches typically are assumed to be supportable on both statistical and conceptual grounds, they are not without certain, often overlooked, drawbacks. First, when covariance adjustments are made on a given dependent variable, subjects may be taken to their lower limits (i.e., "floors") of dependent variable expression. When this occurs, covariance adjustments may leave no residual significant differences among group means, thus leading to potential underestimates of group effects (Neufeld, 1989, pp. 110-112). Second, if measurement of the covariate has been fraught with measurement error, group effects may potentially be overestimated due to incomplete removal of the covariate (Neufeld, 1989). The problem of covariates deviating substantially from true-score values has been noted especially in those cases where the covariate is a single score on some index of stress arousal (e.g., see Turpin, Lobstein, & Siddle, 1980). Finally, in analyses using covariance adjustments, inferences technically must be restricted to the adjusted form of the dependent variable. Questions previously have been raised regarding the psychological meaning of adjusted dependent variables (e.g., Neufeld, 1989; Lees & Neufeld, in press) and regarding their resemblance to unadjusted counterparts (e.g., see Winne, 1983).

In light of the aforementioned difficulties with covariance adjustments, it has been suggested (e.g., Neufeld, 1989; Lees & Neufeld, in press) that analyses of adjusted scores routinely be accompanied by those of unadjusted scores. In contrast to adjusted analyses, unadjusted analyses avoid the problem of residualized dependent variable inferences. In addition, they also potentially render effects which are of greater psychological significance, since they are based on extant, "ecologically valid" dependent measures. Effects which do not produce significant results in the context of existing baseline differences arguably may be of little theoretical or practical interest (Neufeld, 1989).

Results of the split-plot analyses for the four psychophysiological measures are presented in Tables 5-13 through 5-16. Adjusted and unadjusted results are distinguished for the between-subjects factor (Sex) only, as the within-subjects effects remained invariant under covariance adjustments. Means of the psychophysiological variables, adjusted for Pre-experimental baselines, are outlined in Table 5-17.

<u>HRD and HRA</u>: As Tables 5-14 and 5-15 indicate, there were significant main effects for the Interval factor for the HRD and HRA variables, respectively (HRD: $F(1,58)=17.00$, $p < .01$; HRA: $F(1,58)=5.84$, $p < .05$). As Table 5-17 indicates, both measures exhibited significant increases during the Post-letter period (Pre-HRD $M = 73.06$; Post-HRD $M = 74.15$; Pre-HRA $M = 83.42$; Post-HRA $M = 84.30$), suggesting possible psychophysiological reactivity to the stressful letter stimuli. In addition to exhibiting significant main effects for the Interval factor, both measures also exhibited significant Interval x Letter interactions (HRD: $F(8.03, 465.86)=2.26$, $p < .05$; HRA: $F(8.03, 465.86)=2.53$, $p < .01$) and significant main effects for Letters (HRD: $F(7.60, 440.57)=3.21$, $p < .01$; HRA: $F(4.79, 277.99)=2.91$, $p < .01$) which were functions of these Interval x Letter interactions. Graphic representations of the Interval x Letter interactions are outlined in Figures 5-7 and 5-8, respectively. Letter stimuli in these figures are arranged according to increasing subjective probabilities of noise (as measured during the Phase 1 Judgment Trials) with average subjective probability values (measured on a 100-point scale) being listed below the letter stimuli. The two "novel" letter stimuli ("R" and "S"), for which subjective probability

Table 5-13

ANOVA Summary Table for Pre-/Post-Letter Skin Conductance -- SC

Source	df	MS	*F*
Sex (A) (Adjusted)	1	151.85	.65
Regression	1	29243.71	124.24**
Within Cells	57	235.38	
Sex (A) (Unadjusted)	1	1150.70	1.56
Within Cells	58	735.53	
Interval (B)	1	.05	.01
A x B	1	6.71	1.53
Within Cells	58	4.38	
Letters (C)[a]	2.70	29.72	1.22
A x C	2.70	32.59	1.33
Within Cells	156.47	24.45	
B x C[b]	1.13	37.03	1.17
A x B x C	1.13	30.69	.97
Within Cells	65.42	31.70	

** $p < .01$

[a] Huynh-Feldt ϵ for tests involving "Letters" (C) within-subjects effect = .29975

[b] Huynh-Feldt ϵ for tests involving "Interval x Letter" (B x C) within-subjects effect = .12533

Table 5-14

ANOVA Summary Table for Pre-/Post-Letter Heart Rate Deceleration -- HRD

Source	df	MS	*F*
Sex (A) (Adjusted)	1	832.42	1.14
Regression	1	70660.98	96.63**
Within Cells	57	731.22	
Sex (A) (Unadjusted)	1	150.33	.08
Within Cells	58	1936.90	
Interval (B)	1	360.44	17.00**
A x B	1	37.93	1.79
Within Cells	58	21.20	
Letters (C)[a]	7.60	101.25	3.21**
A x C	7.60	33.45	1.06
Within Cells	440.57	31.54	
B x C[b]	8.03	42.58	2.26*
A x B x C	8.03	7.53	.40
Within Cells	465.86	18.84	

** $p < .01$

* $p < .05$

[a] Huynh-Feldt ϵ for tests involving "Letters" (C) within-subjects effect = .84401

[b] Huynh-Feldt ϵ for tests involving "Interval x Letter" (B x C) within-subjects effect = .89246

Table 5-15

ANOVA Summary Table for Pre-/Post-Letter Heart Rate Acceleration -- HRA

Source	df	MS	F
Sex (A) (Adjusted)	1	121.67	.34
Regression	1	85266.54	237.25**
Within Cells	57	359.39	
Sex (A) (Unadjusted)	1	189.29	.10
Within Cells	58	1823.31	
Interval (B)	1	231.37	6.84*
A x B	1	125.87	3.72
Within Cells	58	33.85	
Letters (C)[a]	4.79	266.15	2.91**
A x C	4.79	120.45	1.32
Within Cells	277.99	91.30	
B x C[b]	3.89	247.44	2.53**
A x B x C	3.89	187.16	1.92
Within Cells	225.60	97.69	

** $p < .01$

[a] Huynh-Feldt ϵ for tests involving "Letters" (C) within-subjects effect = .53254

[b] Huynh-Feldt ϵ for tests involving "Interval x Letter" (B x C) within-subjects effect = .43219

Table 5-16

ANOVA Summary Table for Pre-/Post-Letter Muscle Tension -- MT

Source	df	MS	F
Sex (A) (Adjusted)	1	1202.24	.78
Regression	1	17647.46	11.14**
Within Cells	57	1583.86	
Sex (A) (Unadjusted)	1	8584.61	4.61*
Within Cells	58	1860.82	
Interval (B)	1	.65	.04
A x B	1	175.45	9.75**
Within Cells	58	18.00	
Letters (C)[a]	3.47	118.23	1.11
A x C	3.47	227.12	2.12
Within Cells	201.19	106.97	
B x C[b]	6.65	15.48	.65
A x B x C	6.65	18.91	.79
Within Cells	385.62	23.85	

** $p < .01$

* $p < .05$

[a] Huynh-Feldt ϵ for tests involving "Letters" (C) within-subjects effects = .38542

[b] Huynh-Feldt ϵ for tests involving "Interval x Letter" (B x C) within-subjects effects = .73873

Table 5-17

Adjusted Means for Pre-/Post-Letter Analyses of SC, HRD, HRA, MT

Sex

	Males	Females		Males	Females
SC	10.84	11.58			
HRD	72.77	74.43			
HRA	84.18	83.54			
MT	18.97	21.64	MT Unadjusted Means:	17.88	23.23

Interval

	Pre	Post
SC	11.21	11.22
HRD	73.06	74.15
HRA	83.42	84.30
MT	20.58	20.53

Letter

	J	L	M	P	A	Z	V	G	R	S
SC	11.16	11.67	11.11	11.32	10.85	10.82	11.33	11.04	11.33	11.52
HRD	74.17	74.49	73.00	74.43	73.86	73.74	74.41	73.04	73.03	71.91
HRA	83.49	84.28	84.08	85.71	85.00	82.36	84.29	84.12	82.84	82.44
MT	19.94	20.61	20.41	20.08	20.75	21.83	20.27	21.36	19.94	20.36

Sex x Interval

	Pre		Post	
	Males	Females	Males	Females
SC	10.78	11.63	10.90	11.53
HRD	72.05	73.49	74.07	74.81
HRA	83.42	83.42	84.93	83.66
MT	19.05	22.10	19.89	21.17

Interval x Letter

	J	L	M	P	A	Z	V	G	R	S
Pre										
SC	11.08	11.60	11.00	11.32	10.74	10.76	11.27	10.93	11.27	12.06
HRD	73.40	74.01	72.35	73.73	73.03	73.02	73.42	71.79	73.34	72.48
HRA	83.73	83.62	82.71	85.53	84.13	81.29	83.00	82.87	83.44	83.89
MT	19.97	20.74	20.15	20.01	20.62	22.10	20.11	20.86	20.42	20.78
Post										
SC	11.23	11.73	11.22	11.31	10.95	10.87	11.38	11.14	11.39	10.97
HRD	74.94	74.97	73.65	75.12	74.68	74.45	75.40	74.28	72.72	71.33
HRA	83.25	84.94	85.45	85.89	85.87	83.43	85.58	85.36	82.24	80.99
MT	19.91	20.47	20.67	20.14	20.88	21.55	20.43	21.85	19.46	19.94

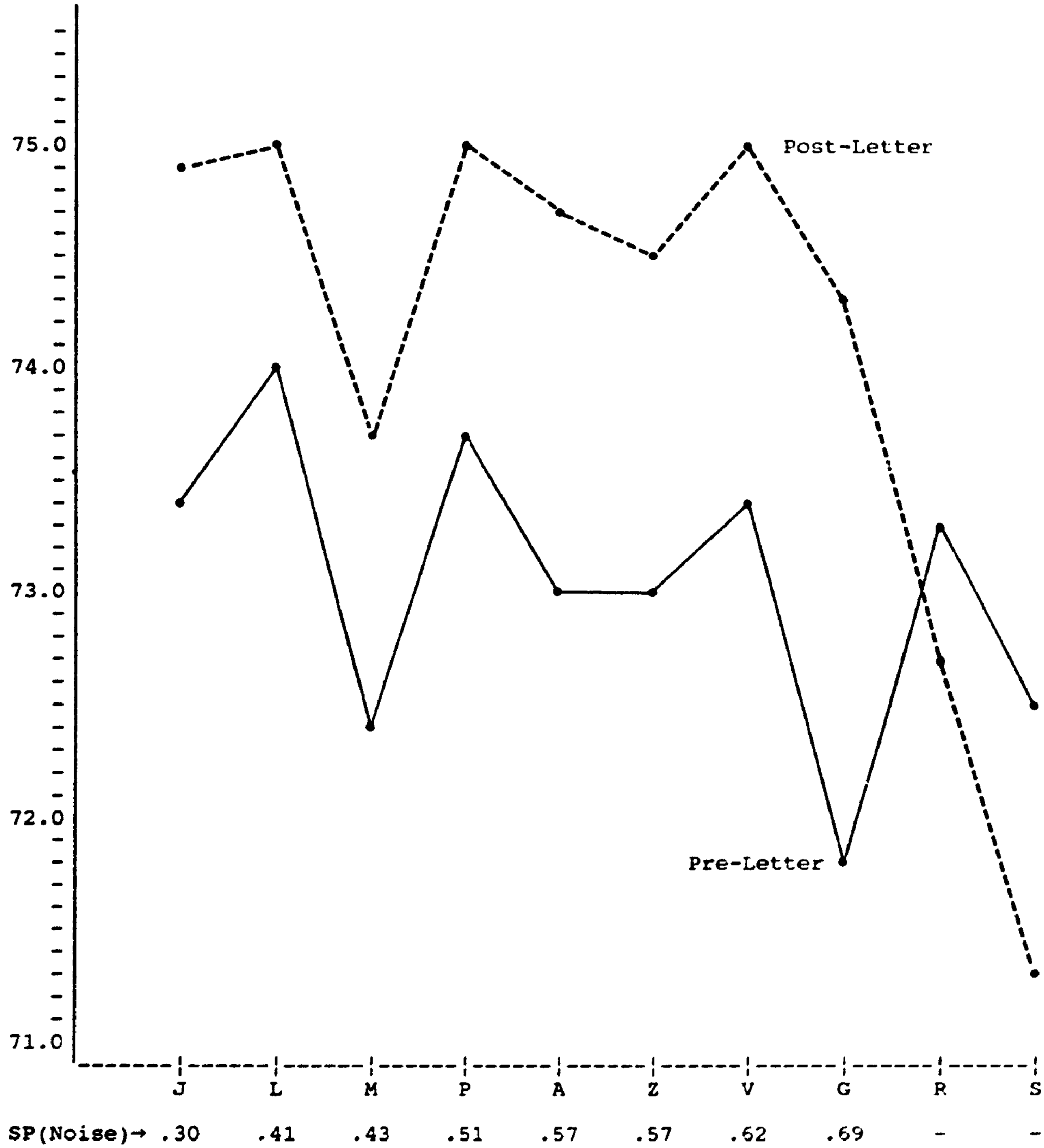
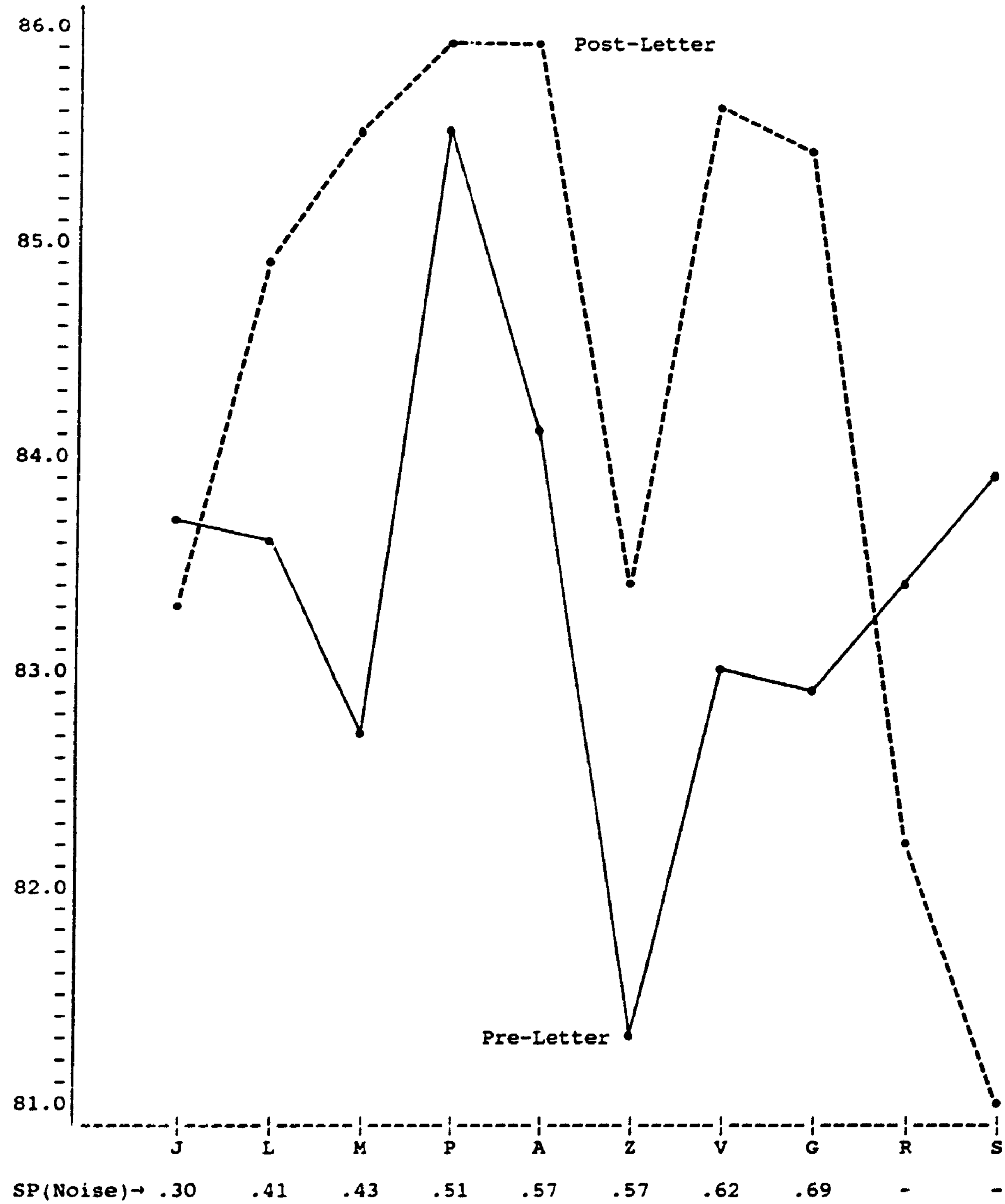


Figure 5-7. Interval x Letter interaction - HRD



<u>Figure 5-8</u>. Interval x Letter interaction - HRA

of noise values were not learned, are presented at the right-most endpoints of the Figure 5-7 and 5-8 abscissas.

As is indicated by Figure 5-7, increases in HRD were evident in the Post-letter period for all but the two "novel" letter stimuli (i.e., "R" and "S"). Furthermore, increases in HRD, as a function of increasing subjective probabilities of noise, tended to be characterized by a clear linear trend. The latter relationship was indicated by a computed correlation of .72 between the original subjective probability of noise values and the Post-Letter minus Pre-Letter HRD differences. Presentations of the newly introduced letter stimuli ("R" and "S") both were followed by decreases in HRD values, suggesting that these stimuli may have been perceived as relatively non-threatening and/or novel.

The Interval x Letter interaction for the HRA variable is outlined in Figure 5-8. This interaction indicates decreases in HRA after the presentation of relatively non-threatening and/or novel letter stimuli (i.e., "J", "R", "S") and increases in HRA during the Post-Letter interval for the remaining, higher noise-probability letters. Furthermore, increases in HRA as a function of increasing subjective probabilities of noise again tended to be characterized by a linear trend. This was indicated by a computed correlation of .67 between the subjective probability of noise values and the Post-Letter minus Pre-Letter HRA differences.

MT: As is suggested by Table 5-16, there was a significant main effect for Sex ($F(1,58)=4.61$, $p < .05$) for the MT variable in the unadjusted split-plot analysis. When levels of MT were controlled for Pre-experimental baselines, however, the significant main effect for Sex disappeared. In addition, the MT variable exhibited a significant Sex x Interval interaction ($F(1,58)=9.75$, $p < .01$) which is outlined in Figure 5-9. As is indicated by Figure 5-9, males experienced MT increases during the Post-letter period, while females experienced MT decreases. These patterns are interesting, given that females were significantly higher than males on MT prior to the covariance adjustment. However,

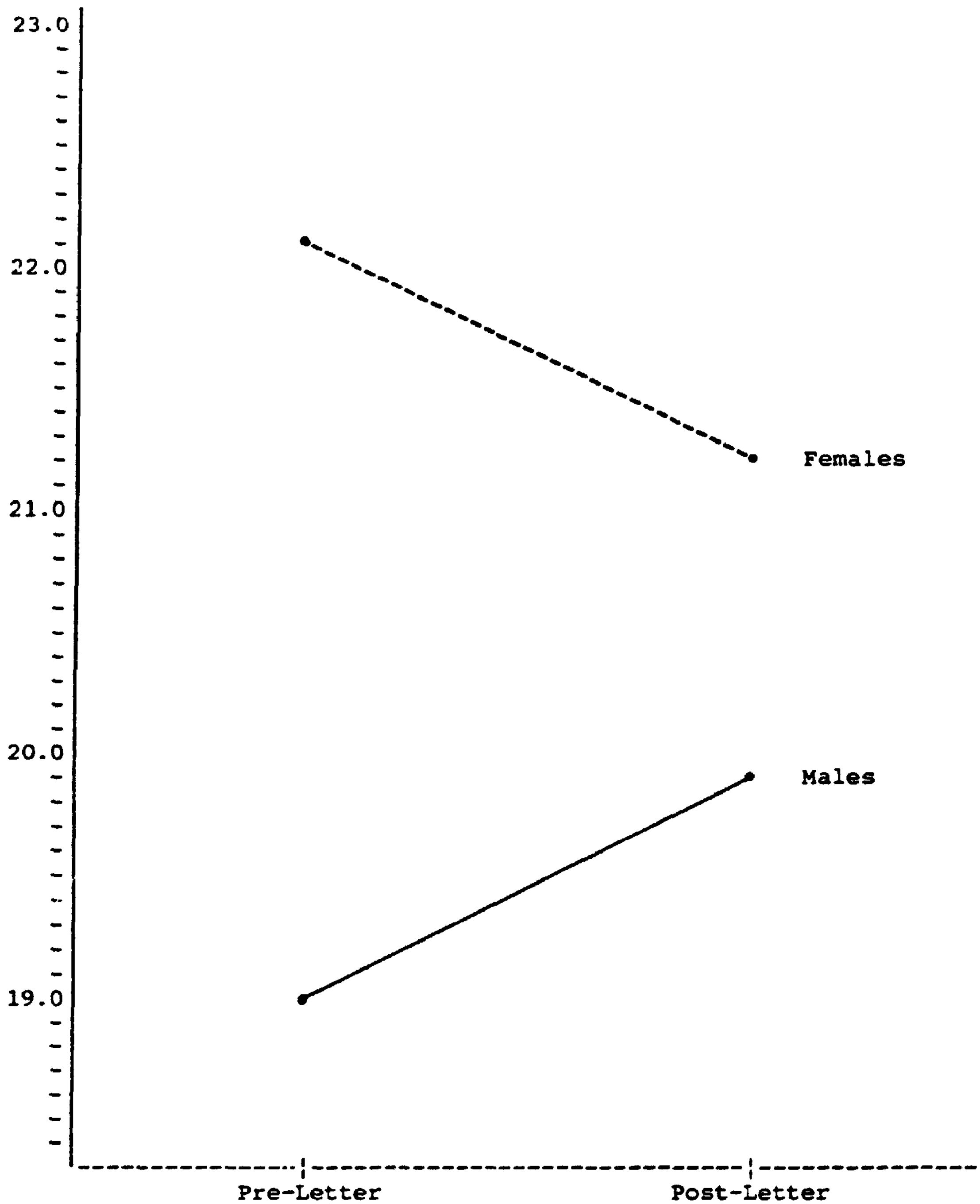


Figure 5-9. Sex x Interval interaction - MT

they also are in keeping with the finding that males tended to associate greater levels of stress expectancy with the letter stimuli than their female experimental counterparts.

Phase 2 - Hypothesis-Relevant Analyses

In order to be congruent with Study One (the model-relevant questionnaire study), it was deemed desirable to conduct hypothesis-relevant correlational analyses using situations (in this case, Letters), as the primary units of analysis. Thus, as in Study One, it became necessary to justify empirically the aggregation of data across subjects.

In contrast to Study One, Study Four involved the analysis of 15 different response variables. In addition to five self-report variables similar to those analyzed in Study One (i.e., Numerator, Denominator, Coping Propensity, Stress Arousal, Ratio), these included two behavioural variables [Reaction Time (RT), Taps] and eight psychophysiological anticipatory stress arousal variables (Skin Conductance, Heart Rate Minimum, Heart Rate Maximum, and Muscle Tension measured during the Pre-ready and Post-ready intervals). Descriptions of these variables and the manner in which they were assessed are outlined in Table 5-18.

A note of clarification is in order regarding the Reaction Time (RT) variable. In those situations in which subjects did not engage in a tapping response, it was possible to score RT as either 5 seconds (the duration of the Go-Stop period) or to consider it as missing data. Although the correlations between these two versions of the RT measure proved to be moderately high ($r = .54$), the latter approach was felt to be preferable for a number of reasons. First, considering RT as 5 seconds when no taps occurred would have been inappropriate at a conceptual level. When no taps occurred, subjects' RT's technically, would have been "infinity", a problematic quantity for data analysis. Second, the imposition of 5 second RT's likely would have resulted in

Table 5-18

Descriptions of the 15 Laboratory Study Response Variables

Variable	Method of Assessment
Self-Report	(Measured during "Ratings" interval)
Numerator	"All things considered, how much stress do you think you'll feel if you do engage in active tapping?"
Denominator	"All things considered, how much stress do you think you'll feel if you do not engage in active tapping?"
Coping Propensity	"All things considered, how motivated do you feel to engage in active tapping?"
Stress Arousal	"All things considered, how much stress do you feel when you think of the upcoming Go-Stop period?"
Behavioural	(Measured during "Go-Stop" interval)
Reaction Time	Time, in seconds, from onset of word "Go" to first tap
Taps	Number of taps executed during 5 sec Go-Stop period
Psychophysiological	
Skin Conductance	Measured during 5 sec Pre- and Post-ready intervals
Heart Rate Deceleration	Measured during 5 sec Pre- and Post-ready intervals
Heart Rate Acceleration	Measured during 5 sec Pre- and Post-ready intervals
Muscle Tension	Measured during 5 sec Pre- and Post-ready intervals

bimodal distributions for the RT variable. This would have been particularly problematic for correlational analyses, which require variables with distributions of similar, normal, shapes. Thus, RT's were considered to be missing data for those epochs where subjects failed to tap. During subsequent presentations, the RT variable will be referred to as "MVRT" (Missing Value Reaction Time).

Points of View Analysis. In order to determine whether collapsing data across subjects was justified at an empirical level, points of view analyses, similar to those conducted in Study One, were conducted for all response variables of interest. Fifteen 60 x 60 matrices of intersubject cross products of ratings were computed, and principal components (points of view) analyses were performed on each matrix of ratings over the 10 stressor (Letter) situations. Eigenvalues associated with the first five extracted principal components are presented for each variable in Table 5-19.

As the eigenvalues in Table 5-19 indicate, the first principal component (i.e., point of view) accounted for the greatest proportion of variance among subjects for all response variables of interest. Across the 15 model-relevant variables, eigenvalues for the first extracted point of view were anywhere from 4 (for the Reaction Time and Ratio variables) to 1600 (for the A2 Heart Rate Acceleration variable) times larger than eigenvalues for the second and subsequent points of view. In addition, with the exception of the A2 Skin Conductance variable, eigenvalues for the second extracted point of view were only 1 or 2 times greater than eigenvalues for the third and subsequent points of view. Thus, on the basis of the Table 5-19 eigenvalues, and the nature of the relative discrepancy between them, it may be concluded that aggregation across subjects was justified for the laboratory response variables.

Note re RT Points of View Analysis: Because the program used to conduct points of view analyses (MATPAK; Jackson, Strasburger, & Paunonen, 1985) did not accommodate missing data, a points of view

Table 5-19

Eigenvalues Derived from the Points of View Analyses of the Laboratory Study Response Variables

Principal Component	I	II	III	IV	V
Self-Report			Eigenvalues		
Numerator	902,388	49,468	36,228	24,256	22,795
Denominator	1,689,965	115,238	40,322	38,734	36,322
Coping Propensity	2,083,836	134,854	49,815	43,000	40,859
Stress Arousal	1,235,205	78,093	42,911	37,034	33,433
Ratio	4,984	1,170	859	266	182
Behavioural					
Reaction Time	2,007	465	198	144	138
Taps	185,437	11,882	5,708	5,028	3,243
Psychophysiological[a]					
A1 Skin Conductance	101,721	284	206	94	78
A1 Heart Rate Dec.	3,329,605	8,422	3,833	2,274	2,079
A1 Heart Rate Acc.	4,482,967	11,476	7,013	2,651	2,180
A1 Muscle Tension	347,325	14,934	8,609	1,892	1,650
A2 Skin Conductance	106,551	5,178	285	186	83
A2 Heart Rate Dec.	3,333,530	2,530	1,863	1,752	1,394
A2 Heart Rate Acc.	4,531,484	2,730	2,045	1,727	1,420
A2 Muscle Tension	332,803	8,391	5,849	3,328	1,513

[a] A1 refers to those measures collected during the first anticipatory stress arousal interval (Pre-ready); A2 refers to those measures collected during the second anticipatory stress arousal interval (Post-ready)

analysis was run on the "5-second" RT variable versus the more appropriate MVRT variable. Although this analysis could not be interpreted as bearing directly on the perceptual homogeneity of the MVRT variable, it could, given the moderate association between the RT and MVRT variables, be considered as giving at least some indication of the perceptual homogeneity of the MVRT variable.

Correlations Between the 15 Laboratory Study Variables. The correlations between the 15 laboratory response variables are outlined in Table 5-20. As is indicated by Table 5-20, there was a strong degree of correspondence between similar measures assessed via different response modalities. For example, self-report measures of Coping Propensity (CP) were highly associated with their corresponding behavioural counterparts. That is, self-reported Coping Propensity (CP) was highly and positively associated with tapping frequency (Taps; r = .96) and highly and negatively associated with reaction time (RT; r = -.70). In addition, self-reported Stress Arousal was moderately highly and positively associated with Heart Rate Acceleration (AC1) and Muscle Tension (MT1) during the first anticipatory phase (r = .61, .49, respectively). In addition, it was moderately and negatively associated with Heart Rate Deceleration (DC1) during this same anticipatory phase (r = -.36).

The correlations also indicate that there was clear support for the choice/control hypothesis regarding the inverse relationship between Coping Propensity and the cost of coping Ratio. This hypothesis was supported by at least three, interrelated pieces of evidence. First, the correlation between the self-report measures of Coping Propensity and the Ratio (i.e., CP and Rat) was high and negative in direction (r = -.72). In addition, the correlations between the behavioural measures of Coping Propensity (i.e., Taps and RT) and the Ratio also were in the predicted direction. The Ratio was strongly and negatively associated with the number of taps executed during the Go-Stop period (r = -.76) and strongly and positively associated with response latency, or

Table 5-20

Correlations Between Model-Relevant Laboratory Study Variables

		Self-Report				Behvrl		Physiological				Physiological			
	NUM	DEN	CP	SA	RAT	TAP	RT	SC1	DC1	AC1	MT1	SC2	DC2	AC2	MT2
NUM		82	91	90	-48	89	-49	-13	-32	41	54	-24	09	46	-10
DEN			98	92	-74	90	-78	-25	-31	58	41	-17	-08	24	-19
CP				94	-72	96	-70	-15	-28	60	47	-12	-06	33	-14
SA					-73	93	-69	-25	-36	61	49	-14	-08	25	-06
RAT						-76	74	15	39	-78	-26	-20	41	-08	02
TAP							-54	-18	-18	69	63	-08	-27	29	03
RT								14	62	-45	10	01	-14	-30	36
SC1									05	-01	-56	84	41	01	-23
DC1										-09	32	00	-24	-17	44
AC1											33	28	-60	07	03
MT1												-56	-47	24	28
SC2													03	-31	-05
DC2														34	-49
AC2															-33
MT2															

NUM = Numerator [E(S)|CA]
DEN = Denominator [E(S)|NCA]
CP = Coping Propensity
SA = Stress Arousal
RAT = Ratio
TAP = Taps
RT = Reaction Time
SC1 = Skin Conductance During First Anticipatory Interval (Pre-ready)
DC1 = Heart Rate Minimum (Deceleration) During First Anticipatory Interval
AC1 = Heart Rate Maximum (Acceleration) During First Anticipatory Interval
MT1 = Muscle Tension During First Anticipatory Interval
SC2 = Skin Conductance During Second Anticipatory Interval (Post-ready)
DC2 = Heart Rate Minimum (Deceleration) During Second Anticipatory Interval
AC2 = Heart Rate Maximum (Acceleration) During Second Anticipatory Interval
MT2 = Muscle Tension During Second Anticipatory Interval

reaction time (RT; $r = .74$). These latter relationships suggest that as the Ratio decreased (and Coping Propensity thus, increased) the number of taps executed and the time until initiation of tapping increased and decreased, respectively.

Although there was clear support for the hypothesis regarding the inverse relationship between Coping Propensity and the Ratio, support for the hypothesis that stress arousal should be most highly associated with the smallest of the Numerator or Denominator components was less clear. In essence, it appeared to depend on the nature of the response modality under consideration, and the phase in which response assessment occurred.

As is indicated by Table 5-20, self-reported anticipatory stress arousal (SA) was strongly and positively associated with both the Numerator (Num) and Denominator (Den) variables (i.e., $r = .90$ and .92, respectively). This was in spite of the fact that the Numerator was significantly smaller than the Denominator in the group of situations (Numerator $M = 34.21$, $SD = 5.09$; Denominator $M = 49.98$, $SD = 11.09$); $t(9) = -6.65$, $p < .01$) and in spite of the fact that it was smaller for each situation (i.e., Letter) presented. In addition, the "Numerator/Stress Arousal" differential-association hypothesis was not supported by the Heart Rate Acceleration (AC1) stress arousal measure during the first anticipatory phase. During the "Pre-ready" phase, Heart Rate Acceleration (AC1) was most strongly associated with the Denominator component of the Ratio ($r = .58$). However, the Numerator/Stress Arousal hypothesis appeared to be supported by the MT measure (MT1) during the first anticipatory phase ($r = .54$). In addition, it also appeared to be supported by the Heart Rate Acceleration measure (AC2) in the second anticipatory (Post-ready) phase. Thus, different response modalities appeared to provide different levels of support for the relationship between stress arousal and the smallest Ratio component. This is in keeping with the notion that different response systems may yield divergent types of stress-relevant information (e.g., see Neufeld, 1978).

Although the choice/control model makes clear predictions about the relationship between Coping Propensity and the cost of coping Ratio, it does not make clear predictions about the relationships that should hold between the Ratio components and Coping Propensity. If one were to consider these components in isolation, however, one might predict that the Numerator of the cost of coping Ratio [E(S)¦CA] should be inversely related to Coping Propensity, and that the Denominator of the cost of coping Ratio [E(S)¦NCA] should be positively related to Coping Propensity. In the correlations between model-relevant variables outlined in Study One (see Table 2-7), this was precisely the relationship that emerged.

Referring to Table 5-20, it can be seen that in the laboratory context, the Numerator was related to both self-reported Coping Propensity and behavioural indicators of Coping Propensity (i.e., Taps, RT) in a manner opposite to that which might logically be predicted. That is, the Numerator was highly and positively associated with self-reported Coping Propensity ($\underline{r}$ = .91) and frequency of tapping ($\underline{r}$ = .89), and moderately and negatively associated with reaction time, or time until initiation of tapping ($\underline{r}$ = -.49). What these relationships suggested was that as the stress expectancy associated with coping activity increased, Coping Propensity also increased.

The choice/control model also does not make clear predictions about the relationship between Coping Propensity and anticipatory stress arousal. Given that the choice/control model assumes that selection of a coping option will be based on the least stressful alternative, however, it follows that in cases where the choice of a coping option is clear (i.e., when there is a clear difference in magnitude between the Numerator and Denominator components), Coping Propensity should be inversely related to stress arousal. That is, stress arousal should be decreased to the extent that coping behaviour promises some mitigation of initial levels of stress arousal, provided that the Denominator is held constant, or is free to vary in a similar manner for each value of the Numerator. Again, this particular pattern was evident in Study One, as Table 2-7 suggests.

In the laboratory context, there clearly was not a negative association between Coping Propensity and anticipatory stress arousal. This conclusion is supported by strong and convergent evidence in Table 5-20 emanating from a number of different response levels. First, the correlations between self-reported Coping Propensity (CP) and both self-reported and psychophysiological stress arousal tended to be strong and positive in nature ($\underline{r}_{CP/SA} = .94$; $\underline{r}_{CP/AC1} = .60$; $\underline{r}_{CP/HT1} = .47$; $\underline{r}_{CP/AC2} = .33$). In addition, the correlations between the behavioural indicators of coping propensity (i.e., Taps, RT) and both self-reported and psychophysiological stress arousal also tended to be strong and positive (i.e., $\underline{r}_{SA/Tap} = .93$; $\underline{r}_{SA/RT} = -.69$; $\underline{r}_{Tap/AC1} = .69$; $\underline{r}_{Tap/HT1} = .63$; $\underline{r}_{RT/DC1} = .62$; $\underline{r}_{RT/AC1} = -.45$). Although these relationships were not necessarily "illogical", as will be discussed further below, they also were not in conformance with model predictions.

Thus, in general, the Table 5-20 correlations suggested that certain model-relevant predictions were strongly supported by the laboratory data, while others were not. Because these relations were obtained by correlating variables across situations, however, it is possible that more idiosyncratic configural patterns may have been obscured. Thus, in accordance with Study Two, a Modal Profile analysis of the stressor (letter) situations was performed to further clarify the relationships between response variables.

<u>Modal Profile Analysis of the Stressor (Letter) Situations</u>:

<u>Note</u>: Because detailed descriptions of the stages of Modal Profile analysis were presented in Study Two, only output from these stages, in conjunction with relevant details, will be presented for the laboratory data.

<u>Stage 1 - Generation of Preliminary Modal Profiles</u>: In the Modal Profile Analysis of the laboratory data, the entities of interest were

the 10 stressor (i.e., Letter) situations, and the attributes of interest were 11 of the 15 response variables outlined in Table 5-18. Because the first anticipatory (i.e., Pre-ready) interval appeared to yield the most robust information in terms of psychophysiological stress arousal, a decision was made to incorporate the psychophysiological measures from this phase only into the Modal Profile Analysis. The second anticipatory (i.e., Post-ready) phase likely was infiltrated with the effects of anticipating the tapping activity (i.e., preparation), making it a potentially less suitable phase for the generation of psychophysiological data (e.g., see Campos & Johnson, 1966, 1967; Johnson & Campos, 1967). Thus, the 11 attributes of interest included the five self-report variables (Numerator, Denominator, Coping Propensity, Stress Arousal, Ratio), the two behavioural measures of Coping Propensity (Taps, Reaction Time), and the four psychophysiological measures of stress arousal from the first anticipatory interval (Skin Conductance, Heart Rate Deceleration, Heart Rate Acceleration, Muscle Tension). As was the case in Study Two, data was partitioned into two random samples by dividing the original sample of 60 subjects into two random samples of 30. Mean values of the 10 letter situations on the 11 model-relevant variables then were calculated for each of the two data sets. The first stage of the analysis thus began with two 10 x 11, Letter x Attribute matrices.

The unrotated "letter" factor matrices resulting from the singular value decompositions of the two data sets are presented in Tables 5-21 and 5-22. Loadings are presented for the first seven factors only, as the remaining factors each had eigenvalues of zero. Eigenvalues, depicting the relative importance of each factor, are printed at the bottom of each letter factor matrix. Sample 1 yielded one large eigenvalue, followed by six of lesser magnitude, while Sample 2 yielded a series of smaller eigenvalues.

When the Table 5-21 and 5-22 eigenvalues were rescaled according to the NC(attributes)/NR(entities) criterion (see Skinner & Lei, 1980),

Table 5-21

Unrotated Letter Factor Matrix - MPA Stage I - Sample I

	I	II	III	IV	V	VI	VII
J	-0.95	-0.12	0.15	0.05	0.08	-0.20	0.08
L	-0.30	-0.33	-0.89	0.12	0.01	-0.12	-0.04
M	0.68	0.39	-0.36	-0.12	-0.49	-0.03	0.04
A	0.57	0.04	0.38	0.67	-0.29	-0.03	-0.02
Z	0.72	0.37	0.06	-0.31	0.13	-0.48	-0.01
V	0.91	-0.15	0.17	-0.21	0.20	0.19	-0.11
P	-0.46	-0.74	0.30	-0.19	-0.26	-0.21	-0.05
G	0.87	-0.33	0.04	0.07	0.32	0.09	0.12
R	-0.75	0.37	0.26	-0.36	-0.15	0.28	0.01
S	-0.71	0.55	-0.01	0.30	0.29	-0.08	-0.06
EV's:	5.15	1.54	1.27	0.88	0.67	0.44	0.04

Note: EV = Eigenvalue

Table 5-22

Unrotated Letter Factor Matrix - MPA Stage I - Sample 2

	I	II	III	IV	V	VI	VII
J	-0.91	0.19	0.17	-0.17	-0.00	0.29	-0.05
L	-0.16	-0.53	-0.55	-0.48	0.32	-0.07	0.24
M	-0.10	0.91	-0.18	0.10	-0.29	0.10	0.13
A	0.28	0.16	0.53	-0.74	0.06	-0.16	-0.18
Z	0.11	0.83	-0.35	0.14	0.07	-0.40	-0.03
V	0.91	-0.21	-0.21	0.15	-0.05	0.15	-0.08
P	0.06	-0.70	-0.11	-0.12	-0.67	-0.15	0.02
G	0.95	-0.02	0.00	0.11	0.18	0.18	0.02
R	-0.53	-0.57	-0.08	0.55	0.19	-0.13	-0.18
S	0.10	-0.14	0.88	0.33	0.05	-0.14	0.25
EV's:	2.96	2.74	1.61	1.30	0.72	0.40	0.21

Note: EV = Eigenvalue

the "eigenvalues greater than one" criterion resulted in the retention, and univocal varimax rotation, of three factors in the first random sample and four factors in the second random sample. The univocal varimax rotated factor matrices for Samples 1 and 2 are presented in Tables 5-23 and 5-24. The letter factors in these matrices may be conceived of as hypothetical "types" representative of letters with salient loadings upon them.

Classification analyses for each of the two samples are outlined in Tables 5-25 and 5-26. As is indicated by these tables, the principal components models generated in each set exhibited relatively good fits to the data. The classification efficiencies for both Samples 1 and 2 were excellent, at 100%. In addition, the generated principal components models accounted for approximately 80% of the total variance in Sample 1, and 86% of the total variance in Sample 2.

In the final phase of Stage 1, factor scores were generated for each attribute variable from the univocal varimax rotated factor matrices. The preliminary modal profiles, represented by the _T_-score forms of these vectors of factor scores, are outlined in Table 5-27.

<u>Stage 2 - Replication of Preliminary Profiles Across Samples</u>: The coefficients of congruence between the within- and across-sample profiles are depicted in Table 5-28. As is indicated, the first preliminary profiles from Samples 1 and 2 showed a high degree of congruence (r = -.89), and the third preliminary profiles from Samples 1 and 2 showed a moderate degree of congruence (r = .54). The second preliminary profile from Sample 2 showed a moderate degree of congruence with both Profiles 2 and 3 from Sample 1 (r = .52, .43, respectively), and the fourth preliminary profile from Sample 2 showed only small degrees of congruence with profiles 1, 2, and 3 from Sample 1 (r = .21, -.32, -.21, respectively).

When these preliminary attribute profiles were transformed into a single k x i best fitting factor score matrix (i.e., via a principal components analysis of the Stage 2 Profile x Variable factor score

Table 5-23

Univocal Varimax Rotated Factor Matrix - Sample 1

	I	II	III
J	0.77	-0.58	-0.12
L	0.03	-0.10	-0.99
M	-0.42	0.75	-0.08
A	-0.44	0.16	0.50
Z	-0.43	0.61	0.32
V	-0.84	0.23	0.33
P	0.04	-0.92	-0.02
G	-0.92	0.11	0.15
R	0.86	-0.12	0.16
S	0.89	0.14	-0.03
Eigenvalues	4.22	2.25	1.50

Table 5-24

Univocal Varimax Rotated Factor Matrix - Sample 2

	I	II	III	IV
J	-0.95	0.09	0.01	0.03
L	-0.08	-0.45	-0.79	0.02
M	-0.14	0.93	0.01	-0.09
A	-0.03	-0.15	0.15	-0.95
Z	0.11	0.90	-0.11	-0.03
V	0.96	-0.98	-0.05	-0.02
P	0.13	-0.66	-0.24	0.13
G	0.92	0.01	0.14	-0.20
R	-0.29	-0.40	0.07	0.81
S	0.00	-0.30	0.91	-0.06
Eigenvalues	2.82	2.59	1.57	1.63

Table 5-25

Stage 1 Classification Analysis - Sample 1

Response Profiles Classified According To Type I		Response Profiles Classified According to Type II		Response Profiles Classified According to Type III	
Letter	Loading	Letter	Loading	Letter	Loading
S	0.89	M	0.75	A	0.50
R	0.86	Z	0.61	L	-0.99
J	0.77	P	-0.92		
V	-0.84				
G	-0.92				
Positive Pole: 3		Positive Pole: 2		Positive Pole: 1	
Negative Pole: 2		Negative Pole: 1		Negative Pole: 1	
Total: 5		Total: 3		Total: 2	

Number of Response Profiles Classified with Loading Criterion |.50|: 10
Classification Efficiency = 100%
Total Percentage of Variance Explained = 79.63

Table 5-26

Stage 1 Classification Analysis - Sample 2

Response Profiles Classified According To Type I		Response Profiles Classified According to Type II		Response Profiles Classified According to Type III	
Letter	Loading	Letter	Loading	Letter	Loading
V	0.96	M	0.93	S	0.91
G	0.92	Z	0.90	L	-0.79
J	-0.95	P	-0.66		
Positive Pole: 2		Positive Pole: 2		Positive Pole: 1	
Negative Pole: 1		Negative Pole: 1		Negative Pole: 1	
Total: 3		Total: 3		Total: 2	

Response Profiles Classified According to Type IV	
Letter	Loading
R	0.81
A	-0.94
Positive Pole: 1	
Negative Pole: 1	
Total: 2	

Number of Response Profiles Classified with Loading Criterion |.50|: 10
Classification Efficiency = 100%
Total Percentage of Variance Explained = 86.06

Table 5-27

Preliminary Attribute Profiles Derived from Stage I of Modal Profile Analysis of Laboratory Data

	Num	Denom	CP	SA	Ratio	MVRT	Taps	SC	HRD	HRA	MT
Sample 1											
Profile 1	39	41	40	43	65	69	40	53	57	47	57
Profile 2	40	53	48	58	36	63	53	32	45	63	57
Profile 3	56	55	56	53	58	49	51	30	53	30	60
Sample 2											
Profile 1	52	[illegible]2	61	58	35	32	57	47	38	55	53
Profile 2	39	51	50	46	45	51	49	33	61	51	73
Profile 3	66	50	46	54	67	46	49	28	43	52	49
Profile 4	36	55	50	48	68	35	39	59	46	59	54

Note: Factor scores are presented in T-Score form (M = 50, SD = 10)

Num = Numerator [E(S)¦CA]
Denom = Denominator [E(S)¦NCA]
CP = Coping Propensity
SA = Stress Arousal
Ratio = Ratio (Numerator/Denominator)
MVRT = Missing Value Reaction Time
Taps = Frequency of Tapping
SC = Skin Conductance (Pre-ready Interval)
HRD = Heart Rate Deceleration (Pre-ready Interval)
HRA = Heart Rate Acceleration (Pre-ready Interval)
MT = Muscle Tension (Pre-ready Interval)

Table 5-28

Coefficients of Congruence Between Within- and Across-Samples Preliminary Modal Profiles

	P1S1	P2S1	P3S1	P1S2	P2S2	P3S2	P4S2
P1S1	1.000	0.000	0.000	-0.893	0.254	-0.097	0.206
P2S1	0.000	1.000	0.000	0.230	0.517	0.039	-0.317
P3S1	0.000	0.000	1.000	0.013	0.430	0.535	-0.208
P1S2	-0.893	0.230	0.013	1.000	0.000	0.000	0.000
P2S2	0.254	0.517	0.430	0.000	1.000	0.000	0.000
P3S2	-0.097	0.039	0.535	0.000	0.000	1.000	0.000
P4S2	0.206	-0.317	-0.208	0.000	0.000	0.000	1.000

Note: P1S1 = Preliminary Profile 1, Sample 1
P2S1 = Preliminary Profile 2, Sample 1
P3S1 = Preliminary Profile 3, Sample 1
P1S2 = Preliminary Profile 1, Sample 2
P2S2 = Preliminary Profile 2, Sample 2
P3S2 = Preliminary Profile 3, Sample 2
P4S2 = Preliminary Profile 4, Sample 2

matrix, see Table 5-27), the "best fitting" single matrix resulting from this procedure contained three vectors of rotated factor scores. These vectors of factor scores, shown in T-score form, are outlined in Table 5-29. They may be conceived of as estimates of the population Modal Profiles underlying the results from the original two samples.

Stage 3: Generalizability of the Modal Profiles: The Stage 3 classification results for the data from Samples 1 and 2 are outlined in Table 5-30. As Table 5-30 suggests, the three Modal Profiles classified 8 out of 10 letter response profiles in Sample 1 (response profiles for "A" and "Z" were not classified), yielding a classification efficiency of 80%. In addition, the total variance explained by the Modal Profiles in Sample 1 was 75.92%.

In Sample 2, the Modal Profiles classified 9 out of 10 letter response profiles (the response profile for "A" was not classified), yielding a classification efficiency of 90%. The total variance explained by the Modal Profiles in Sample 2 was 66.49%.

Interpretation of the Modal Profiles

Note: As was the case in Study Two, the positive and negative poles of Modal Profile I will be referred to as MPI+ and MPI-, the positive and negative poles of Modal Profile II will be referred to as MPII+ and MPII-, and the positive and negative poles of Modal Profile III will be referred to as MPIII+ and MPIII-.

MPI+: A graphic representation of MPI+ is outlined in Figure 5-10. As is illustrated, high points in the profile are represented by the Ratio, Reaction Time (MVRT), and Heart Rate Deceleration (HRD) variables, while low points in the profile are represented by the Numerator, Denominator, Coping Propensity (CP), Stress Arousal (SA) and tapping (Taps) variables. In congruence with the choice/control model, the high level of the Ratio variable is accompanied by low levels of Coping Propensity. Interestingly, low coping propensity is expressed at both the self-report (CP) and behavioural (MVRT, Taps) levels, suggesting converging sources of evidence for this relationship. In an

Table 5-29

Final Modal Profiles Derived from the Laboratory Data

	Num	Denom	CP	SA	Ratio	MVRT	Taps	SC	HRD	HRA	MT
Profile 1	41	40	40	41	67	65	40	54	60	46	55
Profile 2	40	51	50	52	35	62	53	32	55	54	66
Profile 3	64	52	51	53	65	45	50	28	49	38	55

Note: Factor scores are presented in T-score form (M = 50, SD = 10)

Num = Numerator [E(S)¦CA]
Denom = Denominator [E(S)¦NCA]
CP = Coping Propensity
SA = Stress Arousal
Ratio = Ratio (Numerator/Denominator)
MVRT = Missing Value Reaction Time
Taps = Frequency of Tapping
SC = Skin Conductance (Pre-ready Interval)
HRD = Heart Rate Deceleration (Pre-ready Interval)
HRA = Heart Rate Acceleration (Pre-ready Interval)
MT = Muscle Tension (Pre-ready Interval)

Table 5-30

Stage 3 Classification Analysis

Sample 1:

Response Profiles Classified According To Type I

Letter	Loading
R	0.88
J	0.85
S	0.81
V	-0.86
G	-0.94

Positive Pole: 3
Negative Pole: 2
Total: 5

Response Profiles Classified According to Type II

Letter	Loading
M	0.75
P	-0.73

Positive Pole: 1
Negative Pole: 1
Total: 1

Response Profiles Classified According to Type III

Letter	Loading
L	-0.86

Positive Pole: 0
Negative Pole: 1
Total: 1

Sample 2:

Response Profiles Classified According To Type I

Letter	Loading
J	0.94
V	-0.91
G	-0.92

Positive Pole: 1
Negative Pole: 2
Total: 3

Response Profiles Classified According to Type II

Letter	Loading
M	0.86
Z	0.79
R	-0.76

Positive Pole: 2
Negative Pole: 1
Total: 3

Response Profiles Classified According to Type III

Letter	Loading
S	0.64
P	-0.54
L	-0.78

Positive Pole: 1
Negative Pole: 2
Total: 3

Sample 1:
Number of Response Profiles Classified with Loading Criterion |.50|: 8
Classification Efficiency = 80%
Total Percentage of Variance Explained = 75.92

Sample 2:
Number of Response Profiles Classified with Loading Criterion |.50|: 9
Classification Efficiency = 90%
Total Percentage of Variance Explained = 66.49

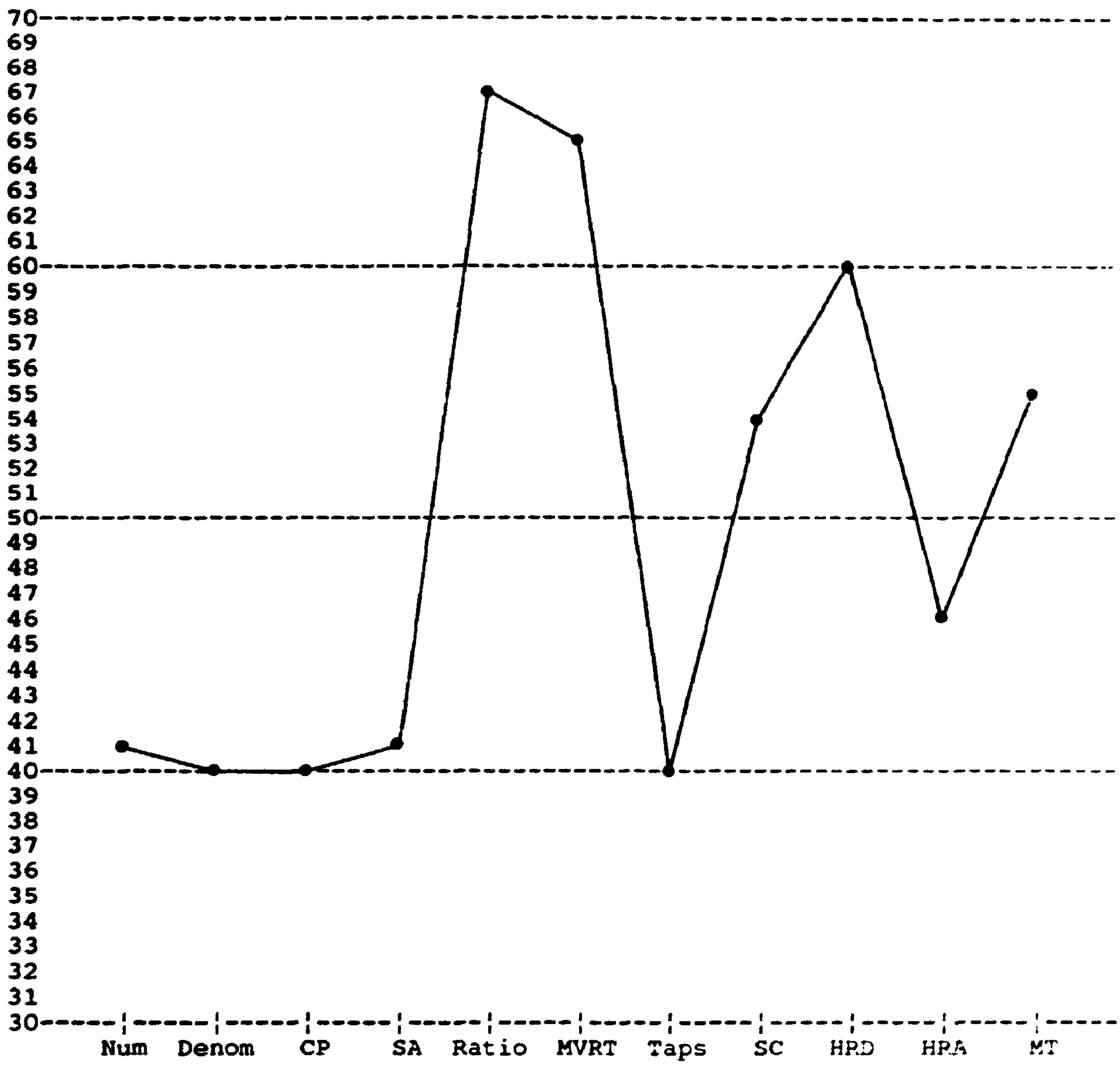


Figure 5-10. Graphic representation of MPI+.

apparently "model-incongruent" manner, the high level of the Ratio variable also is accompanied by low levels of self-reported stress arousal (SA). On the basis of the model, one would expect considerably higher levels of stress arousal, given the near equality of the Numerator and Denominator components. The increased level of Heart Rate Deceleration (HRD), in comparison to Heart Rate Acceleration (HRA), also may be reflective of low stress arousal. As was noted in a previous section, the heart rate deceleration response has been associated with information intake (Blaylock, 1972), orienting responses (Smith & Strawbridge, 1969), and low physical movement (Obrist, 1981). In contrast, the heart rate acceleration response has been proposed to reflect the arousal response to threat, especially in situations requiring active coping (Obrist, 1981).

Because only a small number of situations were clustered under each Modal Profile in the laboratory study, it afforded an opportunity to look at the characteristics of cluster-relevant response profiles in more molecular detail than was possible in Study Two. What these more molecular analyses revealed was that Modal Profiles often were comprised of different subsets of stressor situations which differed in the extent to which they supported the choice/control model.

The response profiles clustering under MPI+ were associated with the letter situations "J", "R", and "S" in Sample 1, and the letter situation "J" in Sample 2. As was indicated previously, these letter situations were associated with the lowest probabilities of noise in the set of 10 letter situations at large (see Table 5-12). In addition, "R" and "S" were the "novel" experimental letter situations about which subjects had no prior probability of noise information.

An examination of the standard score values of model-relevant variables for the letter response profiles (i.e., those on which the Modal Profile analyses were based) indicated that while they indeed, were representative of the Modal Profiles with which they were associated, they varied, according to letter, in terms of the extent to which they were supportive of various choice/control hypotheses. For example, in both Samples 1 and 2, the Numerator value for "J" was substantially larger than the Denominator value (Sample 1; Numerator = -.36, Denominator = -1.08; Sample 2: Numerator = -.26, Denominator = -.94). This was in keeping with the low levels of coping propensity characteristic of the MPI+ profile, and also with the low levels of anticipatory stress arousal. The low level of stress arousal clearly was supportive of the choice/control hypothesis that stress arousal would be associated with the smallest of the Numerator or Denominator components.

In contrast to letter situation "J", where the Numerator value was substantially larger than the Denominator value, the Numerator values for both letter situations "R" and "S" in Sample 1 were slightly lower than the Denominator values (R: Numerator = -.81, Denominator = -.40; S: Numerator = -1.00, Denominator = -.72). Thus, engaging in coping activity, for these two letter situations at least, was associated with slightly lower levels of stress expectancy. However, as was the case with MPII+ in Study Two, the Numerator and Denominator values both were well below average in the "R" and "S" response profiles. Thus, although coping activity may have been preferred, it was not seen as differing dramatically from not coping, and thus, evidently compelled less effusive activity. For letter situations "R" and "S" then, the low level of coping propensity seemed to reflect the relative lack of "urgency" associated with these low probability of noise situations. This lack of urgency was supported by the fact that both coping and not coping were associated with low stress expectancy levels. This was in contrast to the letter "J", where the stress expectancy associated with coping activity clearly exceeded that associated with doing nothing.

For the "R" and "S" response profiles, the high Ratio levels also appeared to be functions of Numerator and Denominator values that were low and relatively similar to one another. As was noted, the high Ratio value in the case of the letter "J" clearly was a function of a higher

Numerator than Denominator component. Thus, the low stress arousal levels associated with letter situations "R" and "S" appeared to be primarily reflective of the lack of stressfulness associated with these situations. Essentially, "R" and "S" represented letter situations where it did not really matter whether one engaged in coping activity or not.

Thus, in general, the MPI+ modal profile cluster appeared to be comprised of two distinct types of stressor situations. One set of situations, represented by the letter "J" in Samples 1 and 2, clearly was supportive of the choice/control hypothesis regarding the inverse relationship between Coping Propensity and the Ratio, and of the choice/control hypothesis regarding the relationship between stress arousal and the smallest Ratio component. In contrast, the other set of situations, represented by the letters "R" and "S" in Sample 1, resembled the MPII+ situations from Study Two. While producing "logical" configural patterns, they nonetheless, placed certain conditions on the choice/control hypothesis regarding Ratios near one and anticipatory stress arousal. Again, the "R" and "S" response profiles suggested that the tenability of this hypothesis would be dependent on the magnitudes of, and degree of discrepancy between, Ratio components. When the Ratio components both were similar and well below average in magnitude, the hypothesis regarding increased stress arousal due to decisional conflict clearly was not supported.

MPI-. A graphic representation of MPI- is outlined in Figure 5-11. As is indicated, high points in the profile are represented by the Numerator, Denominator, Coping Propensity (CP), Stress Arousal (SA) and tapping (Taps) variables, while low points in the profile are represented by the Ratio, Reaction Time (MVRT), and Heart Rate Deceleration (HRD) variables. In congruence with the choice/control model, the low level of the Ratio variable is accompanied by high levels of Coping Propensity. As was the case in MPI+, high coping propensity also is supported by converging sources of evidence from the self-report

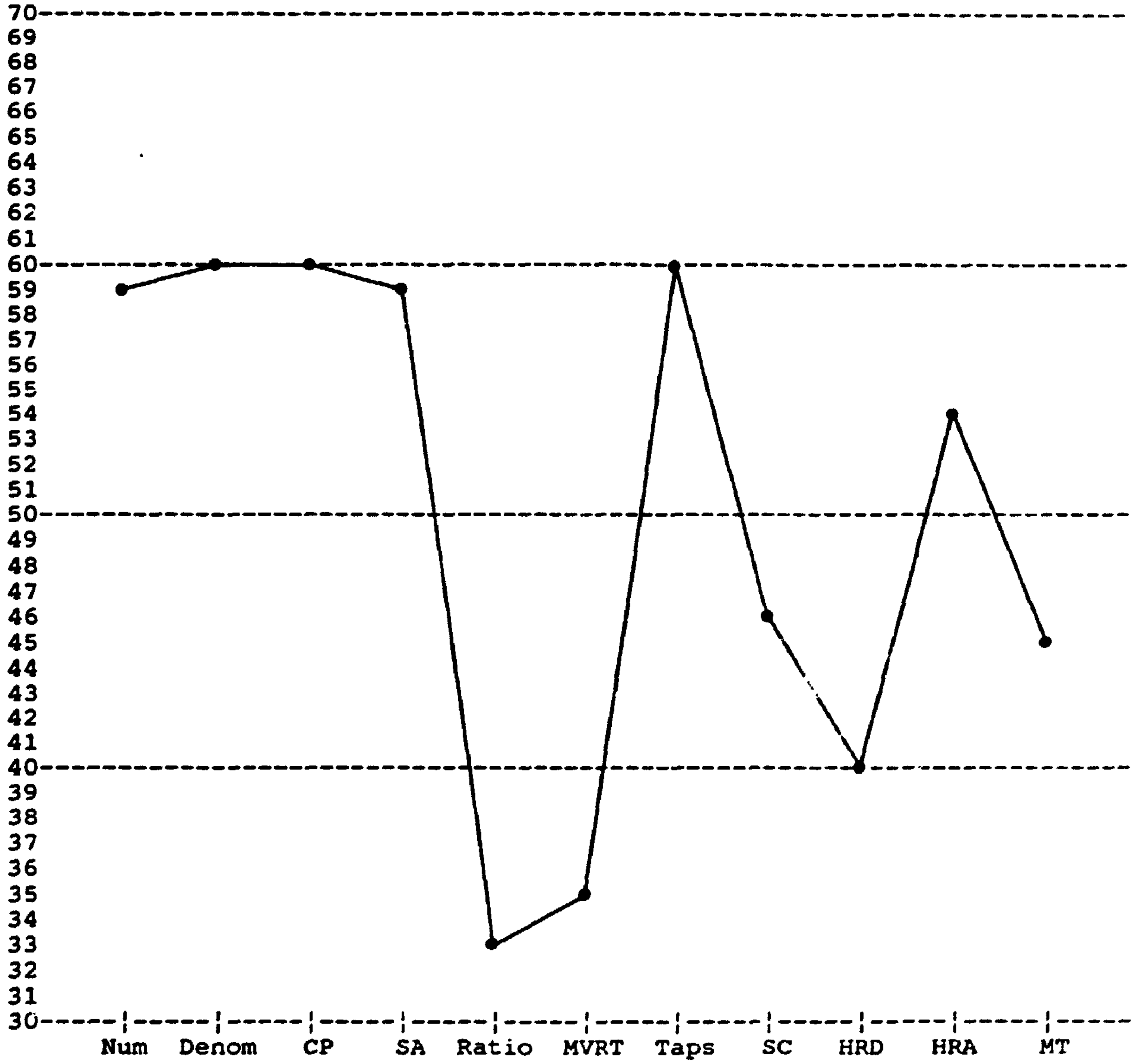


Figure 5-11. Graphic representation of MPI-.

(CP) and behavioural levels (MVRT, Taps). The low level of the Ratio variable also is accompanied by relatively high levels of self-reported stress arousal. Heart Rate Acceleration (HRA), a potential indicant of a psychophysiological arousal response to threat (Obrist, 1981), also is at an above average level in this profile.

The response profiles clustering under MPI- were associated with the letters "V" and "G" in both Samples 1 and 2. As was indicated previously, these were the letter situations associated with the greatest degree of stress impact in analyses of both subjective probability of noise (see Table 5-1) and Denominator judgments (see Table 5-12). As was the case in MPI+, the standard score configurations of model-relevant variables for letter situations "V" and "G" were in accord with their associations with MPI-. However, the nature of these response profile configurations again indicated that these letter situations were differentially supportive of the choice/control model.

In both Samples 1 and 2, the value of the Numerator for the letter "V" was substantially smaller than the value of the Denominator (Sample 1: Numerator = .86, Denominator = 1.55; Sample 2: Numerator = .20, Denominator = 1.63). This Numerator-Denominator discrepancy obviously contributed to the low Ratio and high Coping Propensity levels characterizing MPI-. However, given the size of the Numerator-Denominator discrepancy in the letter "V" situation, the high level of stress arousal in MPI- seemed somewhat model-incongruent. In the "V" situation, where the choice among coping options seemed clear, one might have expected stress arousal to be lower, and to be associated with the smallest of the Ratio components (i.e., the Numerator).

Clearly, the "V" situation is strongly reminiscent of the situations clustered under the MPI- profile in Study Two. In spite of the clear discrepancy between the Ratio components, the level of anticipatory stress arousal does not appear to be primarily a function of the smallest of the Ratio components. As was the case in MPI- in Study Two, a potential explanation for this state of affairs may lie in the magnitudes and relative positions of the Numerator and Denominator components, and in the generation of potential "context effects" associated with these configural patterns.

Like the situations in Study Two's MPI-, the "V" situation in the present study was characterized by a level of stress that was high enough to motivate subjects to want to take controlling action. That is, subjects knew, in situation "V", that the probability of noise was relatively high in the absence of successful coping activity. In addition, like the Study Two MPI- situations, situation "V" also was accompanied by a moderately difficult and risky coping option (i.e., tapping 20 times). Thus, although this coping option clearly was preferred in situation "V", it was not necessarily associated with guaranteed stress mitigation. In situation "V" then, it is possible that increased levels of stress arousal again were due to the existence of "incompatible" response tendencies. While situation "V" clearly motivated coping, coping activity, in and of itself, did not necessarily promise stress alleviation. Again then, the juxtaposition of two incompatible response tendencies may have reminded subjects that they were in potentially "no win" situations. This recognition may have reduced the psychological distinctiveness between the Ratio components, and increased stress arousal to a level that would not have been predicted by the mathematical distinctiveness of the components.

Like the response profiles for the letter "V", the response profiles for the letter "G" also loaded highly on MPI- in both Samples 1 and 2. However, unlike the response profiles for the letter "V", the response profiles for the letter "G" exhibited Numerator and Denominator components which were mu .. closer in terms of relative magnitude (Sample 1: Numerator = 1.08, Denominator = 1.18; Sample 2: Numerator = .76, Denominator = .89). The fact that the Numerator was still smaller than the Denominator in both samples was congruent with the low MPI- Ratio, and also, with the relatively high level of coping propensity characteristic of MPI-.

In contrast to letter situation "V", the closer proximity of the Numerator and Denominator components in situation "G" likely resulted in them being less psychologically distinct. Thus, increased stress arousal, in the case of letter situation "G", likely was attributable to increased decisional conflict. As Table 5-12 indicates, "G" was associated with the highest probability of noise of any of the 10 letter stimuli. This, coupled with the moderate difficulty and potential uncertainty of the available coping task, likely made both coping and not coping stressful in situation "G". Like the MPII- situations from Study Two then, letter situation "G", appeared to represent a relatively high stress situation which was supportive of predicted enhancement in anticipatory stress arousal due to the influence of decisional conflict.

In summary, MPI-, like MPI+, appeared to be comprised of two different types of stressor situations. One set of situations, represented by the letter "V" in Samples 1 and 2, clearly called into question the tenability of the hypothesis regarding the relationship between stress arousal and the smallest of the cost of coping Ratio components. Like the situations clustered under MPI- in Study Two, situation "V" suggested that stress arousal, at least under certain contextual conditions, may be influenced primarily by the largest of the Ratio components. In contrast, the remaining set of situations, represented by the letter "G" in Samples 1 and 2, clearly was supportive of the choice/control hypothesis regarding conflict-induced increases in stress arousal as the cost of coping Ratio approaches one.

MPII+: A graphic representation of MPII+ is outlined in Figure 5-12. As is indicated, high points in the profile are represented by the Reaction Time (RT) and Muscle Tension (MT) variables, measures of coping propensity and psychophysiological stress arousal, respectively. Low points in the profile are represented by maximum Skin Conductance (SC), in addition to the Ratio and Numerator variables. The low Ratio and Numerator levels suggest that low levels of stress expectancy clearly are associated with coping behaviour.

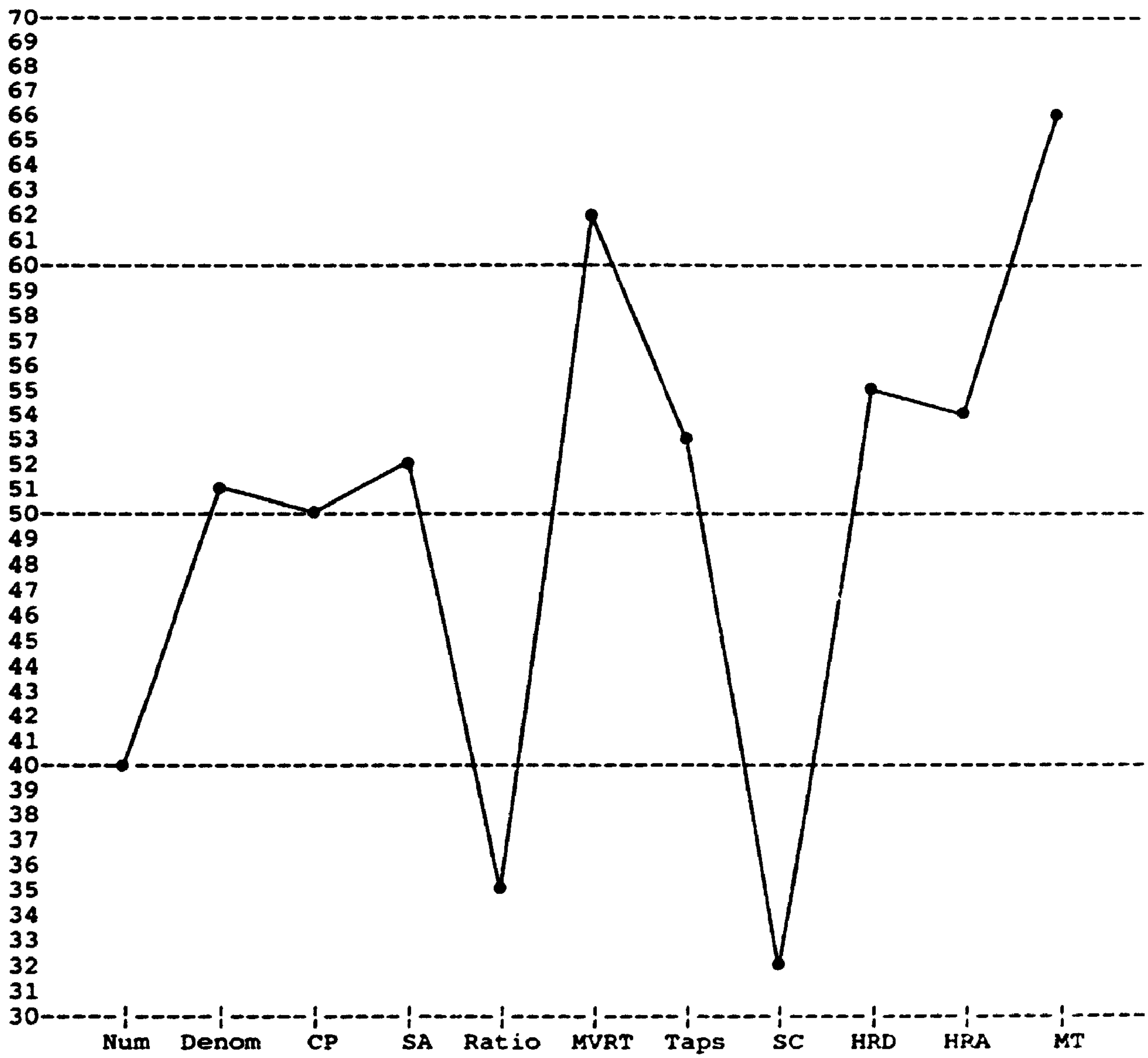


Figure 5-12. Graphic representation of MPII+.

The response profiles clustering strongly under MPII+ were associated with the letters "M" and "M" and "Z" in Samples 1 and 2, respectively. For each of these letter response profiles, the Numerator was substantially lower than the Denominator, suggesting relatively high levels of coping propensity ("M", Sample 1: Numerator = -.46, Denominator = .20; "M", Sample 2: Numerator = -1.10, Denominator = .15; "Z", Sample 2: Numerator = -.99, Denominator = -.23). Interestingly, however, only moderate levels of coping propensity were suggested by the self-report and behavioural measures (i.e., CP and Taps). Given the above Numerator-Denominator discrepancies, and the low level of the Ratio variable, one might have expected coping propensity to be higher. In addition, what is striking is that anticipatory stress arousal is above average in MPII+. This appears to be true for both the self-report measure of stress arousal (SA), and for three of the four psychophysiological measures (HRD, HRA, MT). Again, the Numerator-Denominator discrepancy would suggest a level of anticipatory stress arousal more closely allied with the lowest of the Ratio components (i.e., the Numerator).

A potential explanation for the MPII+ configural pattern may lie in the high value of the Reaction Time variable. The very high Reaction Time level suggests that although coping activity occurred, it occurred relatively slowly, or almost "after the fact". Thus, it appears in this cluster, that the letters were representative of situations where subjects were willing to take "gambles" or "risks". Indeed, Table 5-12 indicates that both "M" and "Z" were associated with levels of stress impact near 50% (i.e., 48% and 55%, respectively). Thus, although coping clearly was "safer", as is indicated by its low stress expectancy value (i.e., see Numerator), subjects nonetheless, may have entertained the notion of not coping. This potentially is indicated by the "hesitation" reflected by the high RT level in the MPII+ attribute configuration. It is almost as if subjects were "sure" about the 50-50 odds characterizing the "M" and "Z" letter situations. Under these conditions of "informational certainty" and relatively diminished levels of threat, subjects may have considered opting for the more "stressful" alternative. Indeed, several subjects reported that they treated the experimental task more like a "game" when they felt that the probabilities of noise were near 50%.

In essence then, MPII+ may be representative of stressor situations which were treated more like "challenges" than negative events. In the stress literature at large, challenges have been associated with "desirable" and "intentional" increases in "stress arousal", and with selection of a clearly "arousing" alternative (e.g., see Lazarus & Folkman, 1984; Paterson & Neufeld, 1989). Under the diminished conditions of threat that clearly characterized MPII+, consideration of the more "stressful" alternative apparently was appealing. This likely was attributable to the fact that selection of this alternative still kept arousal and energy expenditure below undesired states (e.g., see Neufeld, 1990). In the present dissertation, the latter characteristics will be assumed to distinguish challenges from "threats", which are more associated with undesirable energy expenditure and arousal.

Construing the MPII+ situations as "challenges" seemingly would explain MPII+'s "model-incongruent", but enhanced level of "stress arousal". Most particularly, it would explain the enhancement in stress arousal as reflected by the Heart Rate Deceleration (HRD) and Muscle Tension (MT) variables. Each of the latter two responses previously has been associated with attentional and orienting processes, versus preparation for active coping per se (e.g., see Lacey, 1972). Clearly, one would expect such responses from subjects who were "waiting in anticipation", but not necessarily preparing to cope actively with threat. The Heart Rate Acceleration (HRA) and maximum Skin Conductance responses (SC) were relatively lower in the MPII+ profile. Previously, these responses have been more closely linked with active coping and intensity of threat (e.g., Light & Obrist, 1980, 1983; Obrist et al.,

1978) versus attentional processes per se.

MPII-: A graphic representation of MPII- is outlined in Figure 5-13. High points in the profile are represented by maximum Skin Conductance (SC), in addition to the Ratio and Numerator variables. Low points in the profile are represented by the Reaction Time (RT) and Muscle Tension (MT) variables, measures of coping propensity and psychophysiological stress arousal. In general, this profile would appear to suggest quick engagement in coping behaviour that is associated with relatively high stress expectancy levels.

The response profiles clustering strongly under MPII- included "P" and "R" in Samples 1 and 2, respectively. Apparently, the resemblance of these letter response profiles to MPII- was only approximate, given that their profile loadings were only moderately high (-.73, -.76).

In Sample 1, the Numerator value for stressor situation "P" was substantially higher than the Denominator value (Numerator = .96, Denominator = -.67). Thus, these stress expectancy levels suggested that engaging in coping activity was perceived as the more stressful of the two coping options. In Sample 2, the Numerator value for stressor situation "R" was somewhat smaller than the Denominator value (Numerator = -.36, Denominator = -.05). Thus, in this situation, engaging in coping activity was seen as the less stressful of the two coping options.

For both the "P" and "R" situations, the level of coping propensity was moderate, as is indicated by the CP and behavioural tapping (Taps) variables. However, coping also was characterized by an extremely low latency of responding, as the value of the Reaction Time (MVRT) variable suggests. Thus, it is possible that MPII- was representative of "uncertain" situations where individuals felt ambivalent about the probability of stress impact. Empirically, this interpretation appears to be supported in the "P" and "R" profiles by at least four interrelated pieces of evidence.

First, in Sample 1, coping behaviour for stressor situation "P"

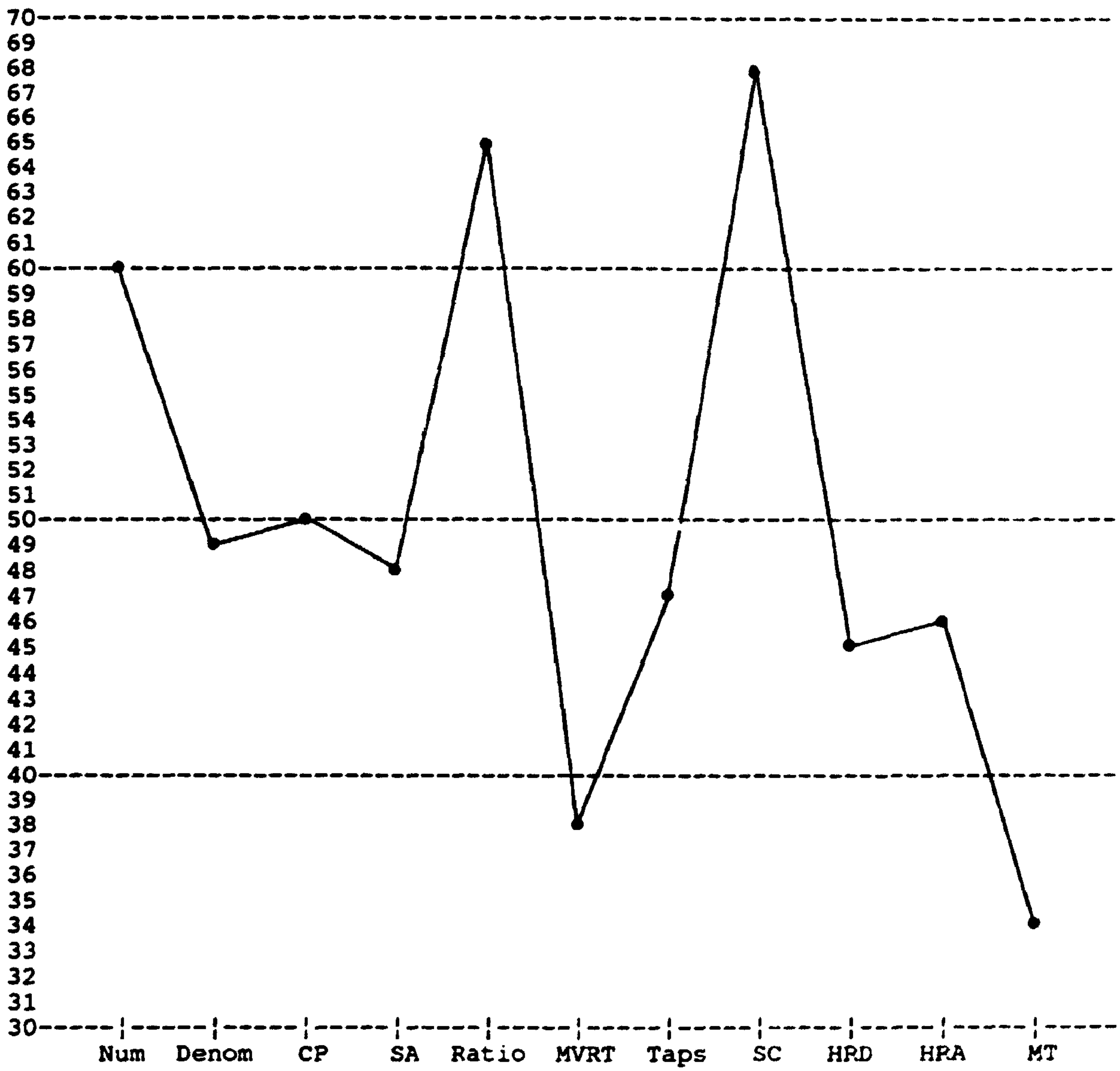


Figure 5-13. Graphic representation of MPII-.

was associated with more stress than doing nothing at all. More specifically, this appeared to be the case at the time that the initial judgments regarding stress expectancy and coping activity were made. However, when the opportunity arose to engage in coping behaviour, it apparently was engaged in a fraction of a second. It was almost as if uncertainty regarding the probability of stress impact impelled subjects to suddenly "play it safe".

Second, the letter "P" was associated with approximately a 50% probability of stress impact (i.e., 46.45%) according to analyses of Denominator judgments (see Table 5-12). This "50-50" rating may have induced a degree of uncertainty regarding the probability of stress impact associated with this letter.

Third, the fact that "impact uncertainty" may have defined these coping situations was reflected by the letter loading highly in Sample 2 (i.e., "R"). As was indicated previously, "R" was one of two novel letter stimuli about which subjects had no prior probability of noise information. Thus, in the case of the letter "R", the decision to engage in coping behaviour was congruent with the pattern of Numerator and Denominator values. However, the fact that stress arousal was higher than might be expected, given this pattern, likely was reflective of stress arousal produced by potential impact uncertainty.

Finally, the level of anticipatory stress arousal in the MPII-profile, as measured by the maximum Skin Conductance (SC) measure, may have been reflective of feelings of "uncertainty-induced" anxiety that occurred just prior to the "Go-Stop" period (e.g., see Epstein & Roupenian, 1970, for evidence that Skin Conductance may be especially sensitive to conditions of conflict). In stressor situation "P", where coping originally was associated with higher stress expectancy, these feelings of anxiety may have prompted a "change of heart". This in turn, may have prompted quick and "impulsive" engagement in coping behaviour, which was reflected by the low level of the Reaction Time variable. The fact that the Skin Conductance measure was higher than its previously assessed self-report counterpart (SA) may have been a function of the period during which it was assessed. Measurement of the Skin Conductance response occurred closer to the Go-Stop period than did measurement of the stress expectancy associated with coping.

Thus, in general, MPII- appears to point to the manner in which "impact uncertainty" may act to increase anticipatory stress arousal. Ambiguity regarding stressor cues previously has been identified as a potent source of stress in investigations of stress-relevant behaviour (e.g., see Paterson & Neufeld, 1989). MPII- additionally suggests that impact uncertainty may exert an unpredicted influence by changing the magnitudes of stress expectancy values over time. Thus, it therefore raises the issue of the potential instability of stress expectancy judgments as the stress transaction process proceeds. When such judgments vary, according to the particular stress transaction phase in which they are assessed, it is possible that certain choice/control predictions will not hold. However, the types of dynamic models necessary to address interactions of entities over time (Neufeld, 1991; Staddon, 1984) were not feasible in the present case.

MPIII+: A graphic representation of MPIII+ is outlined in Figure 5-14. This profile was representative of one letter situation only ("S" in Sample 2), and only moderately representative at that (i.e., "S"/MPII+ loading = .64). In terms of its configural pattern, MPIII+ bears a very strong resemblance to MPII- discussed above. However, in contrast to MPII-, it is characterized by high Muscle Tension levels and low levels of maximum Skin Conductance. Thus, like MPII-, MPIII+ may be representative of configurations induced by uncertainty regarding stress impact. Given that subjects had no prior probability of noise information about "S", such an explanation would appear to make sense. However, in MPIII+, stress activation appears to be encompassed by slightly different psychophysiological indicators of arousal. Such dissociations of psychophysiological measures are not uncommon in the literature on stress, as Epstein and Roupenian (1970) previously have

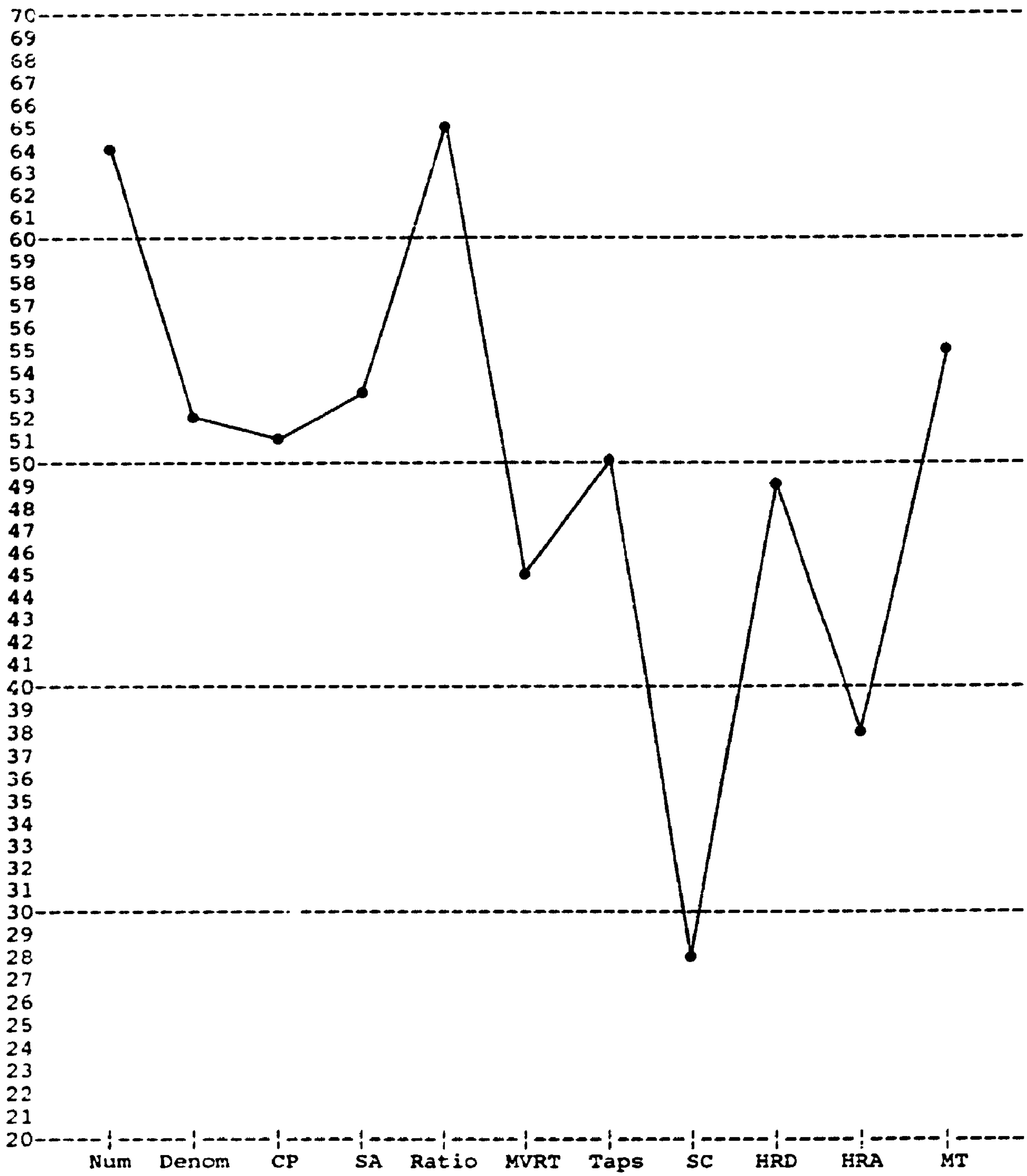


Figure 5-14. Graphic representation of MPIII+.

noted.

MPIII-. A graphic representation of MPIII- is outlined in Figure 5-15. This profile was representative of letter situations "L" and "L" and "P" in Samples 1 and 2, respectively. In terms of its configural pattern, MPIII- bears a very strong resemblance to MPII+ discussed above. However, in contrast to MPII+, it is characterized by high Skin Conductance (SC) levels and low levels of frontalis Muscle Tension (MT). Thus, like MPII+, MPIII- may be representative of configurations induced by "challenging" stressor events. Such an interpretation is supported by the fact that the letters clustering most strongly under this profile were characterized by probabilities of stress impact near 50% (i.e., "L" = 45.6%, "P" = 46.5%). However, like MPIII+, MPIII- is characterized by a pattern of psychophysiological measures (i.e., SC, MT) that lies in opposition to its MPII+ counterpart. As was mentioned previously, such dissociations of psychophysiological measures are not uncommon in the stress literature at large.

Discussion

Phase 1 - Learning and Judgment Trial Analyses

Analyses of the subjective probability of noise judgments during Phase 1 of the laboratory study indicated that subjects did learn distinctions between the noise probabilities associated with the experimental letter stimuli. In addition, they indicated that the learning of this probability information was not affected by order of letter presentation during the Learning or Judgment trials, and that it primarily was reflective of frequencies of noise presentation, as has been demonstrated in previous uses in this laboratory of the Estes paradigm. Thus, use of the Estes paradigm proved to be useful in terms of generating experimental "analog" stressor situations of stochastic threat.

Phase 2 - Preliminary Experimental Trial Analyses

Perceptions of Control. Analyses of the post-experimental control

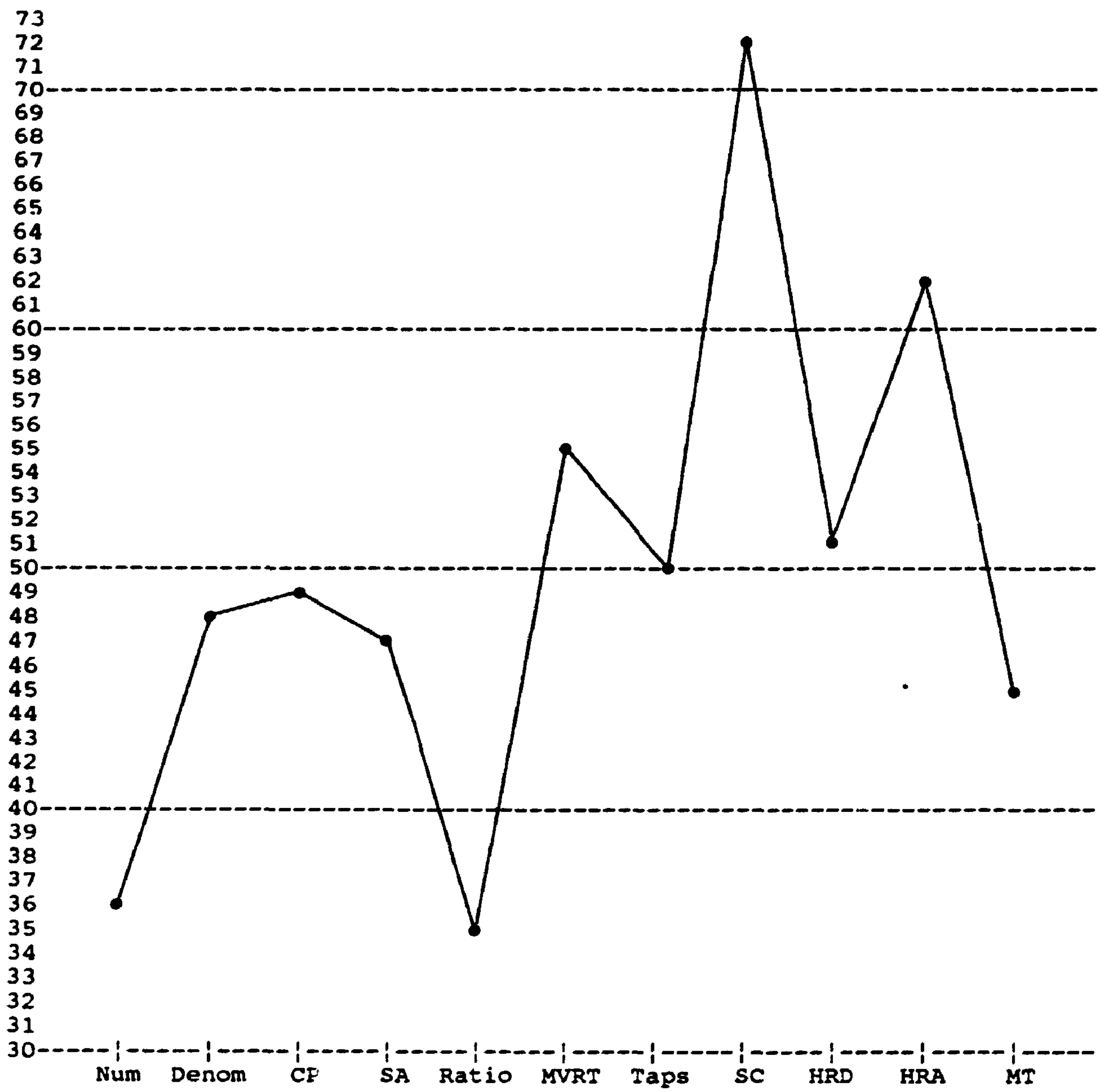


Figure 5-15. Graphic representation of MPIII-.

ratings in Phase 2 suggested that subjects felt they had control during the experimental trials. Interestingly, they also suggested that subjects felt that they had more control during these trials than others subjects who participated in the experiment. These beliefs in control, and enhanced perceptions of control, attested to the strength of the instructional manipulations. Specifically, they indicated that subjects were not aware during the experimental trials that they were never going to experience actual noise delivery.

Trends in the Psychophysiological Data. Analyses of Pre-experimental psychophysiological measures of stress arousal indicated sex differences on two out of four indices. Males were significantly higher than females on Pre-experimental measures of Skin Conductance, while females were significantly higher than males on Muscle Tension. Similar sex differences in psychophysiological responding have been reported widely within the stress literature (e.g., Collins & Frankenhaeuser, 1978; Dobson & Neufeld, 1981; Morrison, Neufeld, & Lefebvre, 1988). Thus, accurate assessments of these responses were supported insofar as they produced results that were convergent with those that previously have been found.

Analyses of Pre-trial psychophysiological measures also indicated changes in psychophysiological reactivity over the course of the experimental trials. That is, Skin Conductance and Heart Rate Deceleration exhibited a tendency to increase across trials, while Muscle Tension, and to a lesser extent, Heart Rate Acceleration, exhibited a tendency to decrease across trials. Interestingly, similar patterns have been found in previous investigations of stress (Morrison et al., 1988) and have been associated with increased degrees of control. This finding may explain the pattern of reactivity found in the present laboratory study, as it is likely that subjects became more comfortable with their ability to control the potential occurrence of noise as the trials progressed.

Retention of, and Reactivity to, Probability of Noise Properties of Experimental Stimuli. A comparison of the Phase 1 and Phase 2 measures of noise probability judgments indicated a high retention of probability of noise information over time. Thus, it is unlikely that experimental results, especially those that were more "difficult" to explain, were a function of decreased potency of experimental stimuli. Indeed, the potency of the letter stimuli was attested to by the fact that the patterns of noise probabilities were similar in Phases 1 and 2. Letters with high and low probabilities of noise clearly were distinguished from each other in these phases, and from letters with more "moderate" noise probabilities. In addition, psychophysiological responses to initial presentations of the letter stimuli appeared to reflect "ordered" responses indicative of stress arousal. For example, both Heart Rate Acceleration and Deceleration showed increases from the Pre- to Post-letter interval, for higher probability of noise letters only. There was also an indication that males showed increases in Muscle Tension from the Pre- to Post-letter period. This was in keeping with the finding that males tended to associate greater levels of stress expectancy with the letter stimuli than their female experimental counterparts.

Phase 2 - Hypothesis-Relevant Analyses

Correspondence Between Similar Measures Assessed By Means of Different Response Modalities. The correlations between model-relevant variables indicated high degrees of correspondence between similar measures assessed by means of different response modalities. For example, self-report measures of coping propensity proved to be highly and logically associated with their corresponding behavioural counterparts (i.e., Reaction Time, Taps). These relationships augment the notion that self-reports of coping inclination ultimately should be measurable by means of the parameters of response effusiveness and latency (Neufeld, 1982). In addition, when assessed across the group of 10 stressor situations as a whole, they suggested that coping intentions translated directly into coping behaviours.

Self-report measures of anticipatory stress arousal also proved to be moderately highly associated with certain psychophysiological indices. For example, self-reported stress arousal showed particularly strong associations with Heart Rate Acceleration and Muscle Tension during the first anticipatory (Pre-ready) phase. The convergence between self-reported and certain psychophysiological measures suggested that the latter may have been reflective of anticipatory stress arousal responses. Indeed, increases in Heart Rate Acceleration previously have been noted to reflect arousal responses to threat (Obrist, 1981) and have been particularly evident in tasks involving controllability (Houston, 1972; Morrison et al., 1988). Although there has been less precedent for frontalis Muscle Tension (Paterson, 1990), it also has been associated with the stress arousing properties of experimental stimuli in previous paradigms (Neufeld, 1976; Neufeld & Davidson, 1974). In addition, it has been associated with decreases in controllability (Morrison et al., 1988) and decreases in cognitive processing and task involvement (Lawler, Obrist, & Lawler, 1976; Obrist, Webb, & Sutterer, 1969).

Hypothesis-Relevant Correlations. The correlational analysis provided clear support for the hypothesized inverse relationship between Coping Propensity and the cost of coping Ratio. In addition, it supported this relationship by means of converging pieces of evidence from the self-report and behavioural levels. However, support was less clear for the hypothesis that stress arousal primarily should be associated with the smallest of the Numerator or Denominator components. At the self-report level stress arousal was slighlty more highly associated with the largest of the Ratio components (i.e., the Denominator). In addition, Heart Rate Acceleration, during the first anticipatory (Pre-ready) phase was most highly associated with the Denominator component of the Ratio. However, Muscle Tension and Heart Rate Acceleration were most highly associated with the smallest

(Numerator) Ratio component in the first and second anticipatory phases, respectively.

Although the aforementioned results suggested that support for the stress arousal hypothesis tended to be dependent on the response modality and phase of assessment under consideration, in general, they appeared to cast more doubt on the stress arousal hypothesis than they did provide strong evidence for it. For example, in the set of 10 stressor situations, the Numerator was significantly smaller than the Denominator, and was smaller for all 10 situations under consideration. Thus, clearly subjects tended to express a preference for coping activity and tended to associate much less stress expectancy with it. However, the stress expectancy associated with not engaging in coping activity still appeared to exert a considerable influence on anticipatory stress arousal. Likely, this was partially attributable to the "in vivo", context in which these responses were assessed. In the "in vivo" context, the threat of the impending stressor was likely more salient than in an imaginal format. That is, subjects were likely much more aware of the consequences that potentially could accrue if they failed to execute the tapping task correctly. This increased awareness of the consequences of unsuccessful coping behaviour may have enhanced the influence of the Denominator value. It, in turn, may have influenced anticipatory stress arousal in a manner not predicted by the choice/control model. It should be noted, however, that the increased salience of the Denominator value cannot be attributed entirely to the "in vivo context". A similar influence of the Denominator variable also was noted in the imaginal format in "MPI-" in Study Two.

"Auxiliary" Correlations. The choice/control model does not make clear predictions about the relationship that should hold between Stress Arousal and Coping Propensity. Rather, it simply makes predictions about the relationship of Stress Arousal to each of the components of the cost of coping Ratio. Similarly, it does not make predictions about the relationship that should hold between Coping Propensity and the cost of coping Ratio components. Rather, it simply makes predictions about the relationship between Coping Propensity and the cost of coping Ratio as whole.

As was stated previously, one would expect an inverse relationship between Coping Propensity and the Numerator variable. That is, as Coping Propensity increases, one would expect a decrease in the stress expectancy associated with coping behaviour. The latter relation is based on the assumption that the Denominator either is constant, or varies in a similar manner over each Numerator value. In addition, one would expect an inverse relationship between Coping Propensity and anticipatory Stress Arousal. That is, one would expect decreases in Stress Arousal to the extent that coping behaviour promised to mitigate original levels of threat. Again, the latter relation is predicated on the assumption that the smaller component of the cost of coping Ratio reduces the value of the Ratio itself. Indeed, each of these relationships was supported in Study One, in the context of an imaginal, questionnaire format. However, in the laboratory study, positive associations emerged between Coping Propensity and the Stress Arousal and Numerator variables, both within and across response modalities.

It is likely that the differences between Studies One and Four were attributable to the different contexts in which responses were assessed. That is, in the laboratory study, where the threat of the impending stressor was perceived as being "real", the salience of the impending threat likely was greatly enhanced. In addition, it also is likely that differences were attributable to the different natures of the coping options that were paired with the stressor situations in Studies One and Four. For example, in the questionnaire study, coping options varied considerably in terms of their effectiveness and associated degrees of threat. However, in the laboratory study, the potential effectiveness of the coping option remained constant, and was not associated with "dire" personal consequences. The tapping response, nonetheless, was characterized by a moderate degree of difficulty and required a potentially undesired amount of effort. In essence then, the coping option in the laboratory study may have been perceived more as a "challenge" than a "negative threat". Further, it may have induced a not entirely unpleasant state of arousal, which was reflective of anticipatory uncertainty regarding coping efficacy and outcome. This potentially would explain the positive associations between Coping Propensity and the Stress Arousal and Numerator variables in the laboratory, versus questionnaire context. The more probable stress impact became, the more likely it was that subjects were motivated to engage in stress mitigating activity. However, the more probable stress impact became, the more uncertain (and thus, aroused) subjects may have become regarding their ability successfully to execute the coping task. Thus, increases in threat clearly led to increases in coping activity and increased "arousal" associated with the latter. However, due to the "challenging" versus "threatening" nature of the laboratory tapping response, this arousal had a more appealing "game-like" quality.

Interestingly, the aforementioned findings suggest that global stress expectancy judgments may be comprised of components of differential weights. The varying weights of these components, may, in turn, have different implications, for the "meaning" of global stress expectancy judgments. For example, in one situation, a Numerator stress expectancy judgment may be reflective primarily of the effort associated with coping. In another situation, a judgment that is identical in terms of magnitude, may be more reflective of efficacy or outcome expectations. To the extent that the meanings of these "similar" global stress expectancy judgments vary according to the values of their constituent components, we might also expect them to vary in their relationships with a number of choice/control variables.
Indeed, Azjen (1991) has noted that similar global expectancy judgments may lead to very different forms of behaviour. In the present study, this may have occurred due to differential influences on Numerator stress expectancy judgments in the laboratory and questionnaire

contexts.

Modal Profile Analysis. The Modal Profile Analysis of the laboratory data generated three profiles of model-relevant variables. It should be noted, however, that only the first Modal Profile was "robust" in terms of its degree of replicability and representativeness of salient situations. The second and third Modal Profiles showed relatively less replicability across samples, and also showed lower degrees of resemblance with the situations they represented. Thus, interpretations associated with the second and third Modal Profiles should be approached with a greater degree of caution. A summary of the Study Four letter response profiles, and their Study Two counterparts, is outlined in Table 5-31.

Modal Profile I

In the laboratory study, the positive and negative poles of Modal Profile I appeared to distinguish the "least threatening" and "most threatening" stressor situations. That is, MPI+ and MPI- represented the letters with the lowest and highest subjective probabilities of noise, respectively, in the set of 10 letters at large. Although the patterns of model-relevant variables characterizing these letter situations were representative of the profiles under which they were clustered, they were not equally supportive of relevant choice/control hypotheses, as more molecular analyses indicated.

MPI+. MPI+ actually was comprised of two different types of stressor situations. One set of situations, represented by letter stimulus "J", clearly was supportive of the hypothesized inverse relationship between Coping Propensity and the cost of coping Ratio. In addition, it also was supportive of the hypothesis that stress arousal primarily should be associated with the lowest of the Numerator or Denominator components. Each of these hypotheses appeared to be supported when the Numerator and Denominator were psychologically discrepant enough to make choice of a coping option seem clear.

Interestingly, stressor situation "J" had a clear "Modal Profile

Table 5-31

Summary of Study Four Letter Response Profiles and Study Two Modal Profile Counterparts

Study 4 Profile	Letter Situations Represented	Study 2 Counterpart	Choice/Control Hypotheses Confirmed and Disconfirmed
			Confirmed
MPI+ ("Low Stress" Situations)	"J"	MPI+	1. Inverse CP/Ratio Relation 2. SA/Lowest Ratio Component
			Disconfirmed
	"R", "S"	MPII+	1. SA/Ratios-Near-One
			Confirmed
MPI- ("High Stress" Situations)	"G"	MPII-	1. SA/Ratios-Near-One
			Disconfirmed
	"V"	MPI-	1. SA/Lowest Ratio Component
			Disconfirmed
MPII+ ("Challenging" Situations)	"M", "Z"	None	1. SA/Lowest Ratio Component
			Disconfirmed
MPII- (Uncertainty Re Stress Impact)	"P", "R"	None	1. SA/Lowest Ratio Component
			Disconfirmed
MPIII+ (Uncertainty Re Stress Impact)	"S"	None	1. SA/Lowest Ratio Component
			Disconfirmed
MPIII- ("Challenging" Situations)	"L", "P"	None	1. SA/Lowest Ratio Component

counterpart" in the context of MPI+ in Study Two. However, whereas MPI+ in Study Two was characterized by high Coping Propensity, and had a larger Denominator than Numerator value, stressor situation "J" was characterized by low Coping Propensity, and had a larger Numerator than Denominator value. Thus, the above two choice/control hypotheses received consistent empirical support in two different experimental contexts and configural patterns. In the laboratory study, however, these hypotheses found further empirical support in the form of behavioural and psychophysiological data.

MPI+ also appeared to represent a second subset of situations whose attribute configurations were not supportive of the choice/control model. In terms of their configural patterns, these situations, represented by the letters "R" and "S", bore a striking resemblance to MPII+ in Study Two. Like MPII+, "R" and "S" were characterized by below average Numerator and Denominator values, and below average levels of Coping Propensity and Stress Arousal. Like MPII+, they also placed clear limitations on the hypothesis regarding anticipatory stress arousal and cost of coping Ratios near one. Specifically, they again supported the previously "tentative" Study Two conclusion that the tenability of this hypothesis would depend on the magnitudes of, and the discrepancy between, the Ratio components. When these components were similar, and below average, the hypothesis regarding increased stress arousal due to decisional conflict again, clearly was not supported.

MPI-. Like MPI+, MPI- represented two types of stressor situations, one of which was model-congruent and one of which was not. Again, these letter situations also had clear "Modal Profile counterparts" in the context of Study Two.

The MPI- model-congruent situation was represented by letter situation "G". Like MPII- discussed previously in Study Two, "G" was characterized by above average Ratio components. Thus, like Study Two's MPII-, "G" also supported the notion of increased stress arousal due to the influence of decisional uncertainty. In essence, it represented a situation where both coping and not coping represented relatively high stress situations. In addition, "G" supported the notion of conflict-induced stress arousal at both the self-report and psychophysiological levels. Thus, this choice/control hypothesis again received clear empirical support across different experimental contexts and response modalities.

The MPI- model-incongruent situation was represented by the letter stimulus "V". Like Study Two's MPI-, "V" was characterized by a configural pattern in which the Numerator and Denominator differed substantially. However, like Study Two's MPI-, "V" suggested that under the latter conditions, stress arousal was not primarily influenced by the lowest of the cost of coping Ratio components. Rather, it was substantially higher than the discrepancy between the Numerator and Denominator levels theoretically would suggest. Again, this increased stress arousal may have been attributable to the pairing of a risky coping option with a clearly "control-motivating", stressful situation. Resulting incompatible response tendencies likely enhanced the "no win" flavour of the situation, and decreased the psychological distinctiveness of the Numerator and Denominator components accordingly. This lack of psychological distinctiveness, may in turn, have increased stress arousal beyond a level predicted by the original Numerator and Denominator judgments. In letter situation "V", evidence of such increased stress arousal was evident at both the self-report and psychophysiological levels.

Modal Profile II

MPII+. MPII+ in the laboratory study appeared to reflect a cluster of "challenging" situations. Previously, challenges have been associated with desirable and intentional increases in stress arousal, and with selection of a clearly "arousing" alternative. Situations apparently were perceived as challenges in MPII+ due to their relatively diminished levels of threat (i.e., 50% probabilities of stress impact). In addition, they also were perceived as challenges as they generated levels of energy expenditure and stress arousal which remained below an undesired state of the organism (e.g., see Neufeld, 1990b).

Although MPII+ was supportive of an inverse relationship between Coping Propensity and the cost of coping Ratio, it called into question the tenability of the hypothesis regarding stress arousal and the smallest Ratio component. In essence, MPII+ suggested that in the context of "challenges", subjects may not choose the least stressful from among available alternatives. Presumably, this is because the arousal associated with the more "stressful" alternative is associated with a relatively "pleasurable" state.

Interestingly, MPII+ raises issues regarding the magnitudes of stress expectancy judgments and the nature of actual coping intents. Typically, it is assumed that stress expectancy judgments will be reflective of coping intentions, and ultimately, final coping behaviours. However, MPII+ raised the possibility that in certain situations at least, stress expectancy judgments may not be in accord with actual coping intents. In cases where this is true, there presumably will be aberrations in model-relevant predictions, as the MPII+ cluster suggests.

MPII-. In contrast to MPII+, MPII- appeared to represent stressor situations where subjects felt "ambivalent" about the probability of stress impact. This ambivalence about stress impact appeared to instigate changes in stress expectancy judgments as the time of stressor delivery drew near. Thus, MPII- raised the issue of the potential instability of certain stress expectancy judgments over the course of the stress-transaction phase. It indicated that to the extent that these judgments vary, according to the stage at which they are assessed, certain choice/control predictions may not hold. "Unstable" stress expectancy judgments indeed could create problems for the choice/control model, especially to the extent that they go undetected. Undetected changes may result in the model being judged as fallible when in fact, only the judgment data themselves are at fault. For example, in assuming that stress arousal will be associated with the lowest of the Ratio components, one also assumes that the designation of this component will not change. To the extent that it does, but goes undetected in analysis, proposed model-relevant relations spuriously may be judged as being "wrong".

It should be noted that in the laboratory study the probable rapidity of potential judgmental changes made them intractable in the short period of time preceding stressor negotiation. Thus, to avoid becoming circular, and potentially non-falsifiable, model-relevant predictions had to be made from a non-dynamic decisional model. In relation to the latter, it thus should be noted that the adopted "static" versus "dynamic" stance was not so much an "assumption" as it was a methodological constraint. In future investigations of the choice/control model, the potentially dynamic nature of the model-relevant relations undoubtedly will have to be subjected to further experimental scrutiny (e.g., see General Discussion).

Modal Profile III. MPIII+ and MPIII- bore a strong degree of resemblance to the negative and positive poles of Modal Profile II, respectively. Their only distinguishing features were that they were characterized by Skin Conductance and Muscle Tension levels that were in direct opposition to their Modal Profile II counterparts. Thus, similar conclusions may be drawn in relation to these clusters as were drawn for the clusters characterizing Modal Profile II. That is, again, they raised issues related to the relation between stress expectancy judgments and coping intentions, and to changes in stress expectancy judgments over time.

Summary

In general, the laboratory study engendered clear empirical support for the tenability of the primary choice/control hypotheses. More importantly, it engendered support in a completely different experimental context and using measurements from different response modalities. However, like previous studies, this study also placed certain limitations on some of the model's more relevant predictions. Of note, is that these limitations appeared to be consistent with those tentatively raised in the context of Study Two.

In addition, the laboratory study identified new clusters of stressor situations that raised associated issues of potential importance. For example, the identification of "challenging" situations led to the observation that in certain circumstances at least, stress expectancy judgments may not be in accord with actual coping intents. Further, in situations characterized by potential "impact uncertainty", it became apparent that stress expectancy judgments may vary over time. Finally, in comparisons of certain Study One and Four results, it became evident that global stress expectancy judgments may be imbued with different "meanings".

Each of the latter issues appeared to have implications for the choice/control model, or more specifically, for the tenability of its proposed relations. Thus, each undoubtedly must be subjected to further experimental scrutiny in future evaluations of choice/control tenets. Relevant avenues of future investigation will be discussed in the General Discussion to follow, subsequent to a final summarization of project results. This summarization will focus on the conditions which both confirmed and disconfirmed the choice/control hypotheses in the series of studies as whole.

CHAPTER 6. GENERAL DISCUSSION

In the present dissertation, a variety of attempts were made to assess the tenability of Neufeld's (1982) choice/control model. In Study One, an attempt was made to assess the validity of the model using an imaginal, questionnaire format. This format was deemed useful in terms of its ability to render stress-relevant cognitions across a wide variety of stressor situations, and to render them within stressor contexts that ethically or practically, could not be produced "in vivo". In addition, Study One was deemed useful in terms of its ability to render information regarding the cognitive configurations of stress-relevant judgments. Knowledge regarding cognitive mappings clearly is important in its own right, as often, cognitive appraisals are the only sources of stress-relevant information available whereby subjects may order their counterstress behaviour.

In Study Two, an attempt was made to extend the findings of Study One by determining whether the 46 Study One situation/coping option pairs were characterized by model-congruent profiles of attribute ratings. Not only was this investigation deemed necessary with respect to engendering support for certain choice/control hypotheses, but it also was deemed necessary with respect to assessing the extent to which the choice/control model actually represented "universal" cognitive/decisional processes (i.e., see Introduction).

In Study Three, an attempt was made to investigate the external validity of the situational attribute profiles derived in Study Two. Thus, rather than being devoted to investigating the validity of the choice/control model per se, Study Three was devoted to the interpretation and potential clarification of certain model-relevant Study Two results.

Finally, Study Four was designed to assess the validity of the choice/control model an a more "in vivo", laboratory context. Wherever possible, the methodology and analyses were designed to parallel those used in Studies One and Two, with the added incorporation of psychophysiological and behavioural measures.

Summary of Project Findings

Table 6-1 outlines a summary of the model-relevant findings from Studies One through Four. The table outlines the primary choice/control hypotheses tested, the results which confirmed and disconfirmed these hypotheses, and the general conditions under which confirmation and disconfirmation occurred. In the following section, the three primary choice/control hypotheses will be discussed with reference to their confirming conditions. This will be followed by a discussion of the contexts and conditions under which the proposed relations apparently did not hold. Subsequent to these presentations, "caveats" and points of future of investigation emanating from these findings will be presented. This will be followed by a brief note relating to the generalizability of the project findings, and a series of final, concluding remarks.

Conditions Confirming the Primary Choice/Control Hypotheses

Support for the Hypothesized Inverse Relationship Between Coping Propensity and the Cost of Coping Ratio. As is indicated by Table 6-1, the series of four studies provided strong empirical support for the hypothesized inverse relationship between Coping Propensity and the cost of coping Ratio. Together, the results of the four studies suggested that the latter hypothesis would be supported: (a) when the Numerator and Denominator Ratio components were statistically and psychologically distinct; and (b) when the magnitude of the distinction between Ratio components resulted in a clear choice among coping options, and clearly discernible outcome and/or efficacy expectations.

Interestingly, the inverse relationship between Coping Propensity and the cost of coping Ratio was supported under both "high" and "low" Coping Propensity conditions. In addition, it also was supported by data from different experimental contexts and different response

Table 6-1

Summary of Model-Relevant Findings from Studies One Through Four

Choice/Control Hypothesis Tested	Confirmed By	Disconfirmed By
CP/Ratio	1. Study 1 correlational/ canonical correlation analyses 2. Study 2 MPI+, MPI- 3. Study 4 correlational analysis 4. Study 4 "J" response profile from MPI+ 5. Study 4 "V" response profile from MPI-	1. Study 2 MPII+ 2. Study 4 "R" and "S" response profiles from MPI+
Salient Conditions →	Numerator and Denominator statistically and psychologically distinct, thus, making choice of coping option seem clear	Numerator and Denominator both below average and perceptually/psychologically indistinct; selection of coping option apparently inconsequential
SA/Lowest Ratio Component	1. Study 1 correlational/ canonical correlation analyses 2. Study 2 MPI+ 3. Study 4 "J" response profile	1. Study 2 MPI-; Study 4 response profile "V" (MPI-); (see Salient Condition 1, below) 2. Study 4 response profiles "M", "Z" (MPII+); "S" (MPIII-) (see Salient Condition 2, below) 3. Study 4 response profiles "P","R" (MPII-) and "L","P" (MPIII+); (see Salient Condition 3, below)
Salient Conditions →	Numerator and Denominator statistically and psychologically distinct; size of Numerator and Denominator discrepancy and nature of coping option such that selection of a coping option is obvious	1. context effects induced by juxtaposition of incompatible response tendencies 2. "challenge" situations 3. situations characterized by "impact uncertainty"

Choice/Control Hypothesis	Confirmed	Disconfirmed
SA/Ratios-Near-One	1. Study 2 MPII- 2. Study 4 "G" response profile from MPI-	1. Study 2 MPII+ 2. Study 4 "R" and "S" response profiles from MPI+
Salient Conditions →	Numerator and Denominator both above average and likely, psychologically indistinct; both coping options associated with high risk	Numerator and Denominator both below average and likely, psychologically indistinct; both coping options associated with low risk

modalities. In Study Two, for example, the inverse Coping Propensity/Ratio relationship was supported at the self-report level by MPI+, where the Numerator was significantly smaller than the Denominator, and the resulting level of Coping Propensity was high. In contrast, the relationship also was supported in Study Four by response profile "J", under conditions where the Numerator was substantially larger than the Denominator, and the resulting level of Coping Propensity was very low. In the latter situation, the inverse Coping Propensity/Ratio relationship also received support at both the self-report and behavioural levels.

Support for the Hypothesis That Stress Arousal Primarily Should be Influenced by the Smallest of the Cost of Coping Ratio Components. Like the inverse Coping Propensity/Ratio relationship, the hypothesis that stress arousal primarily should be influenced by the smallest of the Ratio components also received clear empirical support in the series of four studies. As is indicated by Table 6-1, this hypothesis appeared to be most clearly supported: (a) when the Numerator and Denominator were statistically and psychologically distinct; and (b) when the size of the Numerator/Denominator discrepancy and the nature of the coping option were such that choice of an "optimal" coping option seemed clear. This latter point is important, given that clearly discrepant Numerator and Denominator values did not always result in the clear prediction of levels of model-relevant variables (see below).

As was the case with the Coping Propensity/Ratio hypothesis, the Stress Arousal/Lowest Ratio Component hypothesis also was supported under contrasting configural conditions, and by data from different experimental contexts and different response modalities. For example, in the case of the Study 1 correlational and canonical correlation analyses, and the case of Study Two's MPI+, the hypothesis was supported at the self-report level under conditions where the Numerator was the smallest of the Ratio components. In contrast, in Study Four's response profile "J", the hypothesis was supported at both the self-report and psychophysiological levels under conditions where the Denominator was the smallest of the Ratio components.

<u>Support for the Hypothesis that Stress Arousal Should Increase as the Cost of Coping Ratio Approaches One</u>. The results from Studies Two and Four provided strong empirical support for the hypothesis that stress arousal will increase, due to decisional uncertainty, as the cost of coping Ratio approaches one (see Table 6-1). As might be expected, this hypothesis was supported when the cost of coping Ratio components both were high, and psychologically, if not statistically, indistinct. Evidently, the latter conditions led to increased levels of stress arousal as a result of conflict over response emission versus inhibition. Previously, it has been demonstrated that the coexistence of incompatible response tendencies has been associated with stress arousal in its own right (e.g., see Maher, 1966).

In both studies Two and Four, the "Stress Arousal/Ratios-Near-One" hypothesis clearly was supported by self-report data. In addition, in Study 4, in the context of response profile "J", it additionally was supported by psychophysiological data. Thus, each of the choice/control hypotheses was supported in two different experimental contexts and by data from three different response modalities. Thus, it is unlikely that support for the model can be attributed solely to limited "imaginal" experimental contexts, or to narrow scopes of response variable assessment.

<u>Conditions Potentially Limiting the Tenability of the Primary Choice/Control Hypotheses</u>

Although studies One through Four provided clear support for each of the primary choice/control hypotheses, they also suggested that the tenability of these hypotheses may be limited by: (a) the magnitudes of, and relative discrepancies between, the constituent components of the cost of coping Ratio; and (b) the influence of unpredicted "context" effects arising from certain situation/coping option pairings. Each of the primary choice/control hypotheses will be discussed in turn, with reference to pertinent limiting conditions.

Potential Qualifications to the Hypothesized Inverse Relationship Between Coping Propensity and the Cost of Coping Ratio. As is indicated by Table 6-1, the hypothesized inverse relationship between Coping Propensity and the cost of coping Ratio did not hold when the Numerator and Denominator components of the cost of coping Ratio both were low, and similar in terms of magnitude. Under such conditions, the choice of a coping option seemed inconsequential, and low Coping Propensity did not necessarily accrue from a high cost of coping Ratio. Interestingly, the aforementioned qualifications to the Coping Propensity/Ratio hypothesis also placed limitations on the "auxiliary" model-relevant hypothesis that similar Ratio levels should produce similar levels of Coping Propensity. This latter hypothesis clearly was called into question in Study Two, by a comparison of the MPI- and MPII+ Modal Profile clusters.

In Study Two, both the MPI- and MPII+ Modal Profile clusters were characterized by high, and similar, cost of coping Ratios. Certain differences in the magnitudes of the constituent components of these Ratios, however, evidently led to these clusters being associated with different levels of Coping Propensity. When the constituent components of the cost of coping Ratio both were low, as they were in cluster MPII+, Coping Propensity was markedly high. However, when the constituent components both were very high, as they were in cluster MPI-, Coping Propensity decreased substantially. Thus, changes in constituent Ratio values appeared to have clear implications for levels of Coping Propensity. Specifically, they suggested considerable variation in Coping Propensity as a function of similar Ratio values.

Potential Qualifications to the Hypothesis Regarding Stress Arousal and the Smallest of the Ratio Components. The hypothesis regarding stress arousal and the smallest of the Ratio components was disconfirmed under three relatively different conditions. Because each of these conditions had potentially different implications for the choice/control model, they will be treated individually below.

Condition 1: Unpredicted "Context Effects" Due to the Juxtaposition of Incompatible Response Tendencies. In both MPI- in Study Two, and stressor situation "V" in Study Four, stress arousal was not associated primarily with the smallest of the Ratio components. Interestingly, this state of affairs occurred under conditions in which the Numerator and Denominator apparently were statistically and psychologically distinct, and where the choice of a coping option was in accord with Ratio predictions. Thus, although selection of a coping option itself appeared to stem from "rational" decision-theoretical predictions, the level of stress arousal which subsequently accompanied selection of this coping option apparently did not.

Although the reasons for the unpredicted associations between stress arousal and the Ratio components was not entirely clear in Studies One and Four, a number of pieces of evidence suggest that they may have been attributable to unpredicted "context effects" which acted to decrease the psychological distinctiveness of the Numerator and Denominator Ratio components. In both MPI- in Study Two and stressor situation "V" in Study Four, for example, the stressor situations themselves were characterized by relatively high degrees of threat. This would thus suggest that when presented with these situations, judges likely would have been motivated to take some sort of controlling action. Second, the MPI- and "V" situations also were accompanied by relatively risky coping options with potentially low efficacy and outcome expectations. Thus, although the stressfulness of the situations may have induced a potential motivation to take action, the nature of the available coping options would have made pursuit of this action seem potentially undesirable. In these situations then, the juxtaposition of incompatible response tendencies may have reminded subjects that they were in potentially "no win" situations. This recognition, in turn, may have reduced the perceptual discrepancy between Numerator and Denominator components, and inflated stress arousal beyond a level that would have been predicted by the mathematical distinction between the Ratio components.

One of the enigmas that remains in relation to the latter condition is why the cost of coping Ratio components were not closer in the first place. Clearly, the Numerator and Denominator options initially were associated with different levels of stress expectancy, or one would assume that the MPI- and "V" situations would have been clustered under "high Ratio-high threat" modal profile clusters to begin with (i.e., see MPII- in Study Two, and situation "G" in Study Four). One potential explanation is that at the time that the stress arousal judgments were made, they were tapping different components of stress expectancy than the original Numerator and Denominator judgments. Such an effect potentially could explain the pattern in situation "V", where stress arousal judgments routinely came after assessment of the Numerator and Denominator components. Such an explanation appears unlikely, however, given that an identical configural pattern emerged in Study Two. In Study Two, clusters were based on data in which the order of judgments completely was randomized, and thus, likely not prone to order effects.

Condition 2: Situations Defined as "Challenges" versus "Threats".

The hypothesis regarding stress arousal and the lowest of the cost of coping Ratio components also was not supported by situations empirically defined as "challenges". Previously, challenge situations were associated with "desirable" and "intentional" increases in "stress arousal", and with selection of a more "stressful" alternative. Selection of a more stressful alternative in challenging situations presumably is related to the nature of the stress arousal associated with the latter. Typically, this arousal is reflective of "excitement" or game-like "anticipation" which keeps energy expenditure and stress activation below an undesired state (Neufeld, 1990b).

Although the hypothesis regarding stress arousal and the lowest of the Ratio components was not supported in "challenging" situations, this latter observation may not place conditions on the choice/control model to the extent that certain other model-incongruent findings did. For example, the hypothesis regarding stress arousal and the smallest of the cost of coping Ratio components is based on two interrelated assumptions. These are: (a) that the decision maker is aware of the alternative Ratio values; and (b) that he/she is inclined to select the option associated with the smallest stress expectancy value (Neufeld, 1982). Clearly, the aforementioned discussion suggests that in situations defined as challenges, only the first of these assumptions may be met. For reasons explained above, the second of these two hypothesis-relevant assumptions will not likely be met in so-called "challenging" situations. In addition, in the stress literature at large, "challenges" typically have been separated from "threats" in classifications of stressor situations (Lazarus & Folkman, 1984; Paterson & Neufeld, 1989). Given that the choice/control model applies primarily to situations of impending threat, challenging situations may not be suitable for assessing its tenability.

Condition 3: Situations Characterized by "Impact Uncertainty".

The Stress Arousal/Lowest Ratio Component hypothesis also was not supported in situations characterized by "impact uncertainty". In general, impact uncertainty appeared to induce temporal changes in stress expectancy judgments that detracted from potentially accurate evaluation of the model. For example, in Study Four's MPII-, it appeared that subjects initially associated coping activity with higher levels of stress expectancy than doing nothing at all. However, when the opportunity actually arose to engage in coping behaviour, it appeared that subjects may have experienced a "change of heart". To the extent that this was true, there also would have been a corresponding change in the value of the Numerator judgment. However, detection of this change would not have been possible in Study Four, as Numerator and

Denominator judgments were elicited earlier in time. Thus, in MPII-, the Ratio components emerged as being associated with stress arousal in an apparently model-incongruent manner. However, this may have been attributable to the fact that the Numerator and Denominator judgments were no longer "accurate" indexes of levels of stress expectancy.

Potential Qualifications to the Hypothesis Regarding Stress Arousal and Ratios Near One. As is indicated by Table 6-1, the hypothesis that decisional uncertainty should produce increased levels of stress arousal as the cost of coping Ratio approaches one, clearly was called into question under conditions in which the Ratio components both were low, and similar in terms of magnitude. Under such conditions, the close proximity of the Ratio components produced a correspondingly high value of the cost of coping Ratio. However, rather than producing increased levels of stress arousal, which presumably were reflective of decisional uncertainty, these situations simply engendered levels of stress arousal that were reflective of the low stress situations they were tapping.

Like "challenge" situations, it is possible that very low stress situations less categorically are part of the "threat" domain. Thus again, the aforementioned findings may not jeopardize proposed choice/control relations to the extent that other model-incongruent findings did. Nonetheless, they point to conditions under which the hypotheses forwarded by the choice/control model may not necessarily hold. This knowledge, in and of itself, may be of use in future investigations assessing the tenability of the choice/control model.

"Caveats" and Points of Future Investigation

Investigations of the Perceptual Distinctiveness Between Ratio Components. As was implied in numerous previous discussions, the perceptual, rather the than the mathematical distinctiveness between Ratio components appears to be of primary importance with respect to the tenability of certain choice/control hypotheses. For example, although certain situations in the present dissertation were characterized by Numerator and Denominator components that apparently were mathematically distinct (e.g., see MPI-, Study Two, and response profile "V", Study Four), the operation of certain "context effects" seemed to reduce the psychological discrepancy between Ratio components beyond a level that would have been predicted by their absolute mathematical difference. Thus, findings regarding the potential existence of "context effects" clearly call for investigations into the conditions under which similar levels of mathematical discrepancy result in potentially different levels of psychological or perceptual discrepancy. Such investigations could be aided by pairing situations of varying degrees of stressfulness with coping options characterized by different levels of coping efficacy and/or outcome expectation. Conditions under which certain situation/coping option juxtapositions undermine the apparent perceptual distinctiveness between Ratio components then could be identified, and put forth as conditions which may generate unpredicted model-relevant associations. Such research possibly could make effective use of successive intervals scalings of model-relevant judgments (Torgerson, 1958), as such procedures specifically are concerned with establishing continua of "psychological" or "subjective" magnitudes. Conceivably, such scales would be useful in capturing the discriminal processes which act to identify, distinguish, and/or react to model-relevant components.

Caveats Regarding Inconsistencies in the Magnitudes of Measured Stress Expectancy Judgments and the Nature of Actual Coping Intents. In the choice/control model, it implicitly is assumed that stress expectancy judgments will be reflective of actual coping intents. However, the Study Four "challenge" situations suggested that in certain contexts at least, this assumption cannot automatically be accepted. For example, in the Study Four MPII+ and MPIII- clusters, the lowest level of stress expectancy was associated with coping. Nonetheless, subjects appeared to entertain the notion of not engaging in coping behaviour, and choosing the option associated with the highest level of stress expectancy. Thus, in the latter situations, the magnitude of the Numerator stress expectancy judgment evidently was not reflective of actual coping intents.

Although the aforementioned patterns were uncovered in the context of "challenges", and therefore, may not apply to more model-relevant negative threats, it possible that similar trends will emerge in future investigations in the context of more threatening and thus, model-relevant situations. To the extent that they do, they undoubtedly will have implications for the structure of the choice/control model. Specifically, they will result in certain qualifications being placed on the tenability of certain model-relevant hypotheses.

Investigations Into the "Dynamic" Relations Among Choice/Control Variables. As was noted in Study Four, situations characterized by "impact uncertainty" raised the issue of the potential instability of stress expectancy judgments over time. Changes in stress expectancy judgments presumably will be especially problematic to the extent that they go undetected. Undetected changes may result in criticisms of the choice/control structure, when in fact, only judgment data really are at fault. Indeed, temporal fluctuations in decisional components previously have been noted to detract from accurate evaluations of decisional models by means of the mechanism of incomprehensive measurement (Abelson & Levi, 1985).

As was stated previously, the potentially rapid reciprocal influences of model-relevant entities likely made them intractable in the laboratory's brief anticipatory period. In the face of this possibility, a "bold conjecture" therefore had to be made regarding the continuing net associations among the proposed entities. In the present investigations, the adopted "static" versus "dynamic" stance thus was largely a function a certain methodological constraints. However, future investigations usefully could be devoted examinations of the choice/control structure in a more dynamic/interactive framework. Ideally, such investigations would accommodate potential interactions among model-relevant variables and the rate of change in relevant variables over time. Although such approaches would require the adoption of potentially unfamiliar and complex quantitative methods, appropriate and empirically tractable models currently are available (e.g., see Roughgarden, 1979; Staddon, 1984). Recently, dynamic/interactive formulations have been used to broaden and integrate information from prominent schizophrenia vulnerability models (Neufeld & Nicholson, 1991; Nicholson & Neufeld, 1992). Conceivably, similar approaches could be taken in investigations of the choice/control model involving anticipatory periods of lengthier durations.

Investigations of the Potentially Different Components and Meanings of Global Stress Expectancy Judgments. In Study Four, it was speculated that global stress expectancy judgments may be comprised of different components with varying relative weights (i.e., see "Auxiliary Correlations" in Study Four Discussion). Further, it was speculated that the varying weights of these stress expectancy components may alter the "meaning" of global stress expectancy judgments. To the extent that the meanings of global stress expectancy judgments change according to the relative values of their constituent components, we might also expect them to vary in their relations with a number of choice/control variables. Thus, future investigations of the choice/control model may be served by exploring the constituent components of global stress expectancy judgments. Such investigations could be directed toward both the identification of these components and the decisional implications of their differential weights. Pertinent investigations could be initiated by partitioning global stress expectancy judgments into elements proposed by the theoretical and empirical literatures. Multiple regression analyses then could be used to integrate these elements into more parsimonious, linear composites. Potentially, these composites would be imbued with different meanings, depending on the relative weights of their constituent components. These composites then could be substituted for the single global stress expectancy judgments utilized in the present studies of model-relevant studies. Potential variations in proposed relations subsequently could be investigated using correlational analyses similar to those used in the present dissertation. Such analyses possibly would be useful in determining whether judgments with different "meanings" have different implications for the choice/control model.

A Note on the Generalizability of Model-Relevant Findings

The present dissertation provided strong empirical support for the primary relations proposed by the choice/control model. In addition, it effectively outlined some of the potentially limiting conditions under which certain choice/control hypotheses may not hold. Furthermore, both confirmation and disconfirmation of proposed relations occurred across different experimental contexts and response modalities. Thus, it may be justifiable to state that in most respects at least, the present body of findings was relatively "robust".

It should be noted, however, that conclusions regarding the tenability of the choice/control hypotheses are generalizable only to stressor contexts similar to those utilized in the present dissertation. The characteristics of this project's stressors, due to certain methodological limitations, potentially distinguish them from other stressor situations. For example, in both the questionnaire and laboratory studies, subjects were placed in the rather artificial circumstance of having only two coping options available (i.e., coping and not coping). Furthermore, subjects in these studies did not select the available coping option themselves, but rather, had one arbitrarily "imposed" upon them. It is therefore possible that findings might change in more "real-life" stressful circumstances where individuals must generate, and choose from among, available coping options. Again, this remains a point for future investigations of the tenability of the choice/control model.

Concluding Remarks

Although the hypothesized determinants of coping propensity previously have been investigated from a dispositional approach, there have been few investigations of coping behaviour from a formal decision theoretical approach. Although previous investigators have intimated that decisional processes comprise important precursors to coping activity (e.g., Fisher, 1986; Lazarus & Folkman, 1984; Schonpflug, 1986), there have been few attempts to formulate these processes into stress-relevant decisional models.

The present body of research was motivated by a desire to investigate a cognitive-decisional model of the determinants of coping propensity and anticipatory stress arousal that potentially was more inclusive, and of a broader scope, than prominent previous approaches to these issues. Clearly, the series of investigations was successful in elucidating some of the conditions under which the primary choice/control hypotheses would hold, and also, in elucidating some of the contextual conditions which may place limits on the model's "transpersonal" and "trans-situational" universality (e.g., see Table 6-1). A number of these qualifications suggested that in certain respects at least, the choice/control model may be oversimplifying the clearly complex, and multimodal nature, of the stress transaction process (e.g., see Lazarus & Folkman, 1984).

In the past, critics of research questions which are formulated in the context of formal or formal theoretical structural models have raised similar issues regarding the tendency of these models to oversimplify complex states of affairs. For example, they have suggested that while such models often appear "sophisticated" and "rigorous", they also run the risk of sacrificing the richness of complex phenomena by striving too strongly for theoretical neatness (Neufeld, 1989, p. 89). Such criticisms may be countered by at least two observations. First, unlike more informal, strictly "verbal" theories, formal theories force greater constraints on precision in specifying the relationships between inferred and measured variables (Staddon, 1984, p. 504). When these more precise relations are not clearly understood, they cannot be incorporated into more formal models, not because they do not exist, or because they have been "overlooked", but rather, because they do not yet meet the rigid requirements of more formal structural theorizing. In addition, the way that these relations eventually come to be identified and understood is by way of consistent testing and revising of extant formal models. Through the identification of inconsistencies in extant formal models, one eventually becomes able to slowly and meticulously modify these structures so that they can ultimately accommodate more complex phenomena.

In the present dissertation, the issues raised in relation to the choice/control model clearly have paved the way for numerous future investigations whose results eventually will improve, and change, the structure of the model as it stands now. Even in the absence of these improvements, however, the formal relationships outlined in the model have proved to be of strong heuristic value, as they have laid the groundwork for preliminary tests of "confirming" and "departing" conditions, and the mechanisms potentially underlying these conditions. In addition, they have provided clearly valuable insights into the nature of the cognitive-decisional processes instigating coping activity. The established tenability of these relationships, even in their simple and unmodified form, suggests that the cognitive-decisional approach will comprise a useful alternative framework for investigating the precursors to coping behaviour in the future.

References

Abelson, R. P., & Levi, A. (1985). Decision making and decision theory. In G. Lindzey & E. Aronson (Eds.), Handbook of social psychology (3rd ed., Vol. 1, pp. 231-309). New York: Random House.

Allen, B. P., & Potkay, C. R. (1981). On the arbitrary distinction between states and traits. Journal of Personality and Social Psychology., 41, 916-928.

Andrasik, F., Turner, S. M., & Ollendick, T. H. (1980). Self report and physiologic responding during in vivo flooding. Behavior Research and Therapy, 18, 593-595.

Averill, J. R. (1973). Personal control over aversive stimuli and its relationship to stress. Psychological Bulletin, 80, 286-303.

Averill, J. R., & Rosenn, M. (1972). Vigilant and nonvigilant coping strategies and psychophysiological reaction during anticipation of electric shock. Journal of Personality and Social Psychology, 23, 128-141.

Azjen, I. (1991). The theory of planned behavior. Organizational Behavior and Human Decision Processes, 50, 1-33.

Bandura, A. (1982). Self-efficacy mechanism in human agency. American Psychologist, 37, 122-147.

Blaylock, B. (1972). Some antecedents of directional fractionation: Effects of "intake-rejection," verbalization requirements, and threat of shock on heart rate and skin conductance. Psychophysiology, 9, 40-52.

Bonoma, T. V. (1982). A methodology for the study of individual and social choice behavior. Journal of the Theory of Social Behaviour, 5, 49-62.

Buchwald, A. M. (1977). Depressive mood and estimates of reinforcement frequency. Journal of Abnormal Psychology, 86, 443-446.

Byrne, D. G. (1976). Vigilance and arousal in depressive states. British Journal of Social and Clinical Psychology, 15, 267-274.

Campos, J. J., & Johnson, H. J. (1966). The effects of verbalization instructions and visual attention on heart rate and skin conductance. Psychophysiology, 2, 305-310.

Campos, J. J., & Johnson, H. J. (1967). Affect, verbalization, and directional fractionation of autonomic responses. *Psychophysiology*, *3*, 285-290.

Chung, R. K., Langeluddecke, P., & Tennant, C. (1986). Threatening life events in the onset of schizophrenia, schizophreniform psychosis, and hypomania. *British Journal of Psychiatry*, *148*, 680-685.

Cohen, S. & Edwards, J. R. (1989). Personality characteristics as moderators of the relationship between stress and disorder. In R. W. J. Neufeld (Ed.), *Advances in the investigation of psychological stress* (pp. 235-283). New York: John Wiley & Sons.

Cohen, S., Evans, G. W., Stokols, D., & Krantz, D. S. (1986). *Behavior, health, and environmental stress*. New York: Plenum Press.

Cohen, S., & Roth, S. (1984). Coping with abortion. *Journal of Human Stress*, *10*, 140-145.

Collins, A., & Frankenhaeuser, M. (1978). Stress response in male and female engineering students. *Journal of Human Stress*, *4*, 43-48.

Coombs, C. H. (1975). Portfolio theory and the measurement of risk. In M. F. Kaplan & S. Schwartz (Eds.), *Human judgment and decision processes*. New York: Academic Press.

Deane, G. E. (1969). Cardiac activity during experimentally induced anxiety. *Psychophysiology*, *6*, 17-30.

DeMonbreun, B. G., & Craighead, W. E. (1977). Distortion of perception and recall of positive and negative feedback in depression. *Cognitive Therapy and Research*, *4*, 311-329.

Dobson, K. S., & Neufeld, R. W. J. (1981). Sources of differential stress response associated with psychometrically designated anxiety proneness. *Journal of Personality & Social Psychology*, *40*, 952-961.

Dronsejko, K. (1972). Effects of CS duration and instructional set on cardiac anticipatory responses to stress in field dependent and independent subjects. *Psychophysiology*, *9*, 1-13.

Dunn, O. J., & Clarke, V. (1969). Correlation coefficients measured on the same individuals. *Journal of the American Statistical Association*, *64*, 366-377.

Edwards, W. (1954). The theory of decision making. *Psychological Bulletin*, *51*, 380-417.

Ekehammar, B., & Magnusson, D. (1973). A method of study stressful situations. Journal of Personality and Social Psychology, 27, 176-179.

Ekehammar, B., Schalling, D., & Magnusson, D. (1975). Dimensions of stressful situations: A comparison between a response analytical and a stimulus analytical approach. Multivariate Behavioral Research, 10, 155-164.

Endler, N. S., & Magnusson, D. (1976). Towards an interactional psychology of personality. Psychological Bulletin, 5, 956-974.

Epstein, S, & Clarke, S. (1970). Heart rate and skin conductance during experimentally induced anxiety: The effects of anticipated noxious stimulation and experience. Journal of Experimental Psychology, 84, 105-112.

Estes, W. K. (1976). The cognitive side of probability learning. Psychological Review, 83, 37-64.

Eyesenck, M. W. (1989). Personality, stress arousal, and cognitive processes in stress transactions. In R. W. J. Neufeld (Ed.), Advances in the investigation of psychological stress (pp. 133-160). New York: Wiley.

Feather, N. T. (1982). Introduction and overview. In N. T. Feather (Ed.), Expectations and actions: Expectancy-value models in psychology (pp. 1-14). New Jersey: Lawrence Erlbaum.

Fischhoff, B., Goitein, B., & Shapira, Z. (1982). The experienced utility of expected utility approaches. In N. T. Feather (Ed.), Expectations and actions: Expectancy-value models in psychology (pp. 315-339). New Jersey: Lawrence Erlbaum.

Fishburn, P. C., & LaValle, I. H. (1992). Multiattribute expected utility without the Archimedian axiom. Journal of Mathematical Psychology, 36, 573-591.

Fisher, S. (1986). Stress and strategy. New Jersey: Lawrence Erlbaum Associates.

Folkman, S., Lazarus, R. S., Dunkel-Schetter, C., DeLongis A., & Gruen, R. J. (1986). Dynamics of a stressful encounter: Cognitive appraisal, coping, and encounter outcomes. Journal of Personality and Social Psychology, 50, 992-1003.

Gaito, J. (1961). Repeated measurements designs and counterbalancing. Psychological Bulletin, 58, 46-54.

Gal, R. G., & Lazarus, R. S. (1975). The role of activity in anticipating and confronting stressful situations. Journal of Human Stress, 4, 4-20.

Genest, M. (1989). The relevance of stress to rheumatoid arthritis. In R. W. J. Neufeld (Ed.), Advances in the investigation of psychological stress (pp. 343-366). New York: John Wiley & Sons.

Geisser, S., & Greenhouse, S. W. (1958). An extension of Box's results on the use of the F distribution in multivariate analyses. Annals of Mathematical Statistics, 29, 885-891.

Gilbert, M. A., Bauman, K. E., & Udry, R. J. (1986). A panel study of subjective expected utility for adolescent sexual behavior. Journal of Applied Social Psychology, 16, 745-756.

Glass, D. C. (1977). Behavior patterns, stress and coronary disease. New Jersey: Erlbaum.

Grings, W. W., & Sukoneck, H. I. (1971). Prediction probability as a determiner of anticipatory and preparatory electrodermal behavior. Journal of Experimental Psychology, 91, 310-317.

Haan, N. A. (1969). A tripartite model of ego functioning: Values and clinical research applications. Journal of Nervous and Mental Disease, 148, 14-30.

Hobfall, S. E. (1988). Conservation of resources: A new attempt at conceptualizing stress. American Psychologist, 44, 513-524.

Hodges, W. F., & Felling, J. P. (1970). Types of stressful situations and their relation to trait anxiety and sex. Journal of Consulting and Clinical Psychology, 34, 333-337.

Hodgson, R., & Rachman, S. (1974). Desynchrony in measures of fear. Behavior Research and Therapy, 12, 319-326.

Hogarth, R. M. (1987). Judgement and choice (2nd ed.). New York: John Wiley & Sons.

Holmes, T., & Rahe, R. H. (1967). The social readjustment rating scale. Journal of Psychosomatic Research, 4, 189-194.

Holmstrom, V. L., & Beach, L. R. (1973). Subjective expected utility and career preferences. Organizational Behavior and Human Performance, 10, 201-207.

Houston, B. K. (1972). Control over stress, locus of control, and response to stress. Journal of Personality and Social Psychology, 21, 249-255.

Huynh, H., & Feldt, L. S. (1976). Estimation of the Box correction for degrees of freedom from sample data in the randomized block and split-plot designs. Journal of Educational Statistics, 1, 69-82.

Jackson, D. N. (1984). Personality research form manual (3rd ed.). Goshen, NY: Research Psychologists Press.

Jackson, D. N., & Skinner, H. A. (1975). Univocal varimax: An orthogonal factor rotation program for optimal simple structure. Educational and Psychological Measurement, 35, 663-665.

Jackson, D. N., Strasburger, E. L., & Paunonen, S. V. (1985). MATPAK: A package of matrix operations for large-scale computers. Research Bulletin # 637. London: Department of Psychology, University of Western Ontario.

Janis, I. L., & Mann, L. (1977). Decision making: A psychological analysis of conflict, choice, and commitment. New York: The Free Press.

Johnson, H. J., & Campos, J. J. (1967). The effect of cognitive tasks and verbalization instructions on heart rate and skin conductance. Psychophysiology, 4, 143-150.

Kahneman, D., & Tversky, A. (1973). On the psychology of prediction. Psychological Review, 80, 237-251.

Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decisions under risk. Econometrica, 47, 263-291.

Kanner, A. D., Coyne, J. C., Schaefer, C., & Lazarus, R. S. (1981). Comparison of two modes of stress measurement: Daily hassles and uplifts versus major life events. Journal of Behavioral Medicine, 4, 1-39.

Kendzierski, D., & Lamastro, V. (1988). Reconsidering the role of attitudes in exercise behaviour: A decision theoretic approach. Journal of Applied Social Psychology, 18, 737-759.

Kirk, R. E. (1982). Experimental design: Procedures for the behavioural sciences (2nd ed.). California: Brooks/Cole.

Kuiper, N. A. (1978). Depression and causal attributions for success and failure. Journal of Personality and Social Psychology, 36, 236-246.

Kunreuther, H. (1976). Limited knowledge and insurance protection. Public Policy, 24, 227-261.

Lacey, J. I. (1972). Some cardiovascular correlates of sensorimotor behaviour: Examples of visceral afferent feedback. In C. H. Hockman (Ed.), Limbic system mechanisms and autonomic function (pp. 175-201). Springfield, Ill.: C. C. Thomas.

Laux, L., & Vossel, G. (1982). Paradigms in stress research: Laboratory versus field and traits versus processes. in L. Goldberger & S. Breznitz (Eds.). Handbook of stress: Theoretical and Clinical Aspects (pp. 203-211).

Laux, L., Glanzmann, P., & Schaffner, P. (1982). General versus situation-specific traits as related to anxiety in ego-threatening situations. In C. D. Spielberger, I. G. Sarason, & P. B. Defares (Eds.), Stress and anxiety (Vol. 9). Washington: Hemisphere.

Lawler, K. A., Obrist, P. A., & Lawler, J. E. (1976). Cardiac and somatic response patterns during a reaction time task in children and adults. Psychophysiology, 13, 448-455.

Lazarus, R. S., & Folkman, S. (1984). Stress, appraisal, and coping. New York: Springer.

Lefave, M. K., & Neufeld, R. W. J. (1980). Anticipatory threat and physical danger trait anxiety: A signal-detection analysis of effects on autonomic responding. Journal of Research in Personality, 14, 283-306.

Lees, M. C., & Neufeld, R. W. J. (in press). Matching the limits of clinical inference to the limits of quantitative methods: A formal appeal to practice what we consistently preach. Canadian Psychologist.

Light, K. C., & Orbrist, P. A. (1980). Cardiovascular responses to stress: Effects of opportunity to avoid shock experience and performance feedback. Psychophysiology, 17, 243-252.

Light, K. C., & Obrist, P. A. (1983). Task difficulty, heart rate reactivity, and cardiovascular responses to an appetitive reaction time task. Psychophysiology, 20, 301-312.

Lindop, C. R., & Gibson, S. (1982). The concept of coping. Psychological Medicine, 12, 385-395.

Magnusson, D. (1971). An analysis of situational dimensions. Perceptual and Motor Skills, 32, 851-867.

Magnusson, D., & Ekehammar, B. (1973). An analysis of situational dimensions: A replication. Multivariate Behavioral Research, 8, 331-339.

Magnusson, D., & Ekehammar, B. (1978). Similar situation - similar behaviors? A study of the intraindividual congruence between situation perception and situation reactions. Journal of Personality, 12, 41-48.

Magnusson, D., & Ekehammar, B. (1975). Anxiety profiles based on both situational and response factors. Multivariate Behavioral Research, 10, 27-43.

Magnusson, D. (1976). The person and the situation in an interactional model of behavior. Scandinavian Journal of Psychology, 17, 253-271.

Maher, B. A. (1966). Principles of psychopathology: An experimental approach. New York: McGraw-Hill.

Marascuilo, L. A., & Levin, J. R. (1983). Multivariate statistics in the social sciences: A researcher's guide. CA: Brooks/Cole.

Maule, A. J. (1985). Cognitive approaches to decision making. In G. Wright (Ed.), Behavioral decision making (pp. 61-84). New York: Plenum Press.

Maxwell, S. E. (1980). Pairwise multiple comparisons in repeated measures designs. Journal of Educational Statistics, 5, 269-287.

Menninger, K. (1963). The vital balance: The life process in mental health and illness. New York: Viking.

Mellstrom, M., Zuckerman, M., & Cicala, G. A. (1982). General versus specific tests in the assessment of anxiety. Journal of Consulting and Clinical Psychology, 46, 423-431.

Miller, C. A. (1956). The magical number seven, plus or minus two. Psychological Review, 63, 81-97.

Miller, S. M. (1979). Controllability and human stress: Method, evidence, and theory. Behavior Research and Therapy, 17, 287-304.

Miller, J. K., & Farr, D. (1971). Bimultivariate redundancy: A comprehensive measure of interbattery relationship. Multivariate Behavioral Research, 6, 313-324.

Miller, S. M., & Grant, R. P. (1979). The Blunting hypothesis: A view of predictability and human stress. In P. Sjoden, S. Bates, & W. S. Dockens (Eds.), Trends in behaviour therapy (pp. 135-151). New York: Academic Press.

Morrison, M. S., Neufeld, R. W. J., & Lefebvre, L. A. (1988). The economy of probabilistic stress: Interplay of controlling activity and threat reduction. British Journal of Mathematical and Statistical Psychology, 41, 155-177.

Mothersill, K. J., & Neufeld, R. W. J. (1985). Probability learning and coping in dysphoria and obsessive-compulsive tendencies. Journal of Research in Personality, 19, 152-169.

Muchinsky, P. M., & Fitch, M. K. (1975). Subjective expected utility and academic preferences. Organizational Behavior and Human Performance, 14, 217-226.

Nelson, R. E., & Craighead, W. E. (1977). Selective recall of positive and negative feedback, self-control behaviors, and depression. Journal of Abnormal Psychology, 86, 379-388.

Neufeld, R. W. J. (1976). Evidence of stress as a function of experimentally altered appraisal of stimulus aversiveness and coping adequacy. Journal of Personality and Social Psychology, 33, 632-646.

Neufeld, R. W. J. (1978). Veridicality of cognitive mapping of stressor effects: Sex differences. Journal of Personality, 4, 623-644.

Neufeld, R. W. J. (1982). On decisional processes instigated by threat: Some possible implications for stress-related deviance. In R. W. J Neufeld (Ed.), Psychological stress and psychopathology (pp. 240-270). New York: McGraw-Hill.

Neufeld, R. W. J. (1989). Methodological aspects of laboratory studies of stress. In R. W. J. Neufeld (Ed.), Advances in the investigation of psychological stress (pp. 71-132). New York: John Wiley & Sons.

Neufeld, R. W. J. (1990a). Morrison, Neufeld, and Lefebvre's game theoretic approach to stress and decisional control: Some further mathematical results. Research Bulletin #688, Department of Psychology, University of Western Ontario.

Neufeld, R. W. J. (1990b). Coping with stress, coping without stress, and stress with coping: On inter-construct redundancies. Stress Medicine, 6, 117-125.

Neufeld, R. W. J., & Davidson, P. O. (1974). Sex differences in stress response: A multivariate analysis. Journal of Abnormal Psychology, 83, 178-185.

Neufeld, R. W. J., & Herzog, H. (1983). Acquisition of probabilities in anticipatory appraisals of stress. Personality and Individual Differences, 4, 1-7.

Neufeld, R. W. J., & Paterson, R. J. (1989). Issues concerning control and its implementation. In R. W. J. Neufeld (Ed.), Advances in the investigation of psychological stress (pp. 43-67). New York: Wiley.

Nicholson, I. R., & Neufeld, R. W. J. (1989). Forms and mechanisms of susceptibility to stress in schizophrenia. In R. W. J. Neufeld (Ed.), Advances in the investigation of psychological stress (pp. 392-420).

Nicholson, I. R., & Neufeld, R. W. J. (1992). A dynamic vulnerability formulation of stress and schizophrenia. American Journal of Orthopsychiatry, 62, 117-130.

Niemela, P. (1964). Electrodermal response as a function of quantified threat. Scandinavian Journal of Psychology, 10, 49-56.

Obrist, P. A. (1981). Cardiovascular psychophysiology: A perspective. New York: Plenum.

Obrist, P. A., Webb, R. A., & Sutterer, J. R. (1969). Heart rate and somatic changes during aversive conditioning and a simple reaction time task. Psychophysiology, 15, 102-115.

Obrist, P. A., Gaebelein, C. J., Teller, E. S., Langer, A. W., Grignolo, A., Light, K. C., & McCubbin, J. A. (1978). The relationship among heart rate, carotid, dP/dt, and blood pressure in humans as a function of type of stress. Psychophysiology, 15, 102-115.

Ohman, A., Bjorkstrand, P., & Ellstrom, P. (1973). Effect of explicit trial-by-trial information about shock probability in long interstimulus interval GSR conditioning. Journal of Experimental Psychology, 98, 145-151.

Paterson, R. J. (1990). Choice availability and the stress response. Unpublished doctoral dissertation, University of Western Ontario, London.

Paterson, R. J., & Neufeld, R. W. J. (1987). Clear danger: The perception of threat when parameters are known. Psychological Bulletin, 101, 404-416.

Paykel, E. S. (1978). Contribution of life events to causation of psychiatric illness. Psycnological Medicine, 8, 245-253.

Payne, J. W. (1982). Contingent decision behavior. Psychological Bulletin, 92, 382-402.

Pearlin, L. I, Menaghan, E. G., Lieberman, M. A., & Mullan, J. T. (1981). The stress process. Journal of Health and Social Behavior, 22, 337-356.

Pearlin, L. I., & Schooler, C. (1978). The structure of coping. Journal of Health and Social Behavior, 19, 2-21.

Rockstroh, B., Elbert, T., Lutzenberger, W., & Birbaumer, N. (1979). Slow cortical potentials under conditions of uncontrollability. Psychophysiology, 16, 374-380.

Rogan, J. C., Keselman, H. J., & Mendoza, J. L. (1979). Analysis of repeated measurements. British Journal of Mathematical and Statistical Psychology, 32, 269-286.

Roth, S., & Cohen, L. J. (1986). Approach, avoidance, and coping with stress. American Psychologist, 41, 813-819.

Rotter, J. B. (1966). Generalized expectancies for internal versus external control of reinforcement. Psychological Monographs: General and Applied, 80, (1, Whole No. 609).

Roughgarden, J. (1979). Theory of population genetics and evolutionary ecology: An introduction. New York: MacMillan.

Schoemaker, P. J. (1982). The expected utility model: Its variants, purposes, evidence, and limitations. Journal of Economic Literature, 29, 529-563.

Schonpflug, W. (1986). Behavior economics as an approach to stress theory. In M. H. Appley & R. Trumbull (Eds.), Dynamics of stress: Physiological, psychological, and social perspectives (pp. 81-98). New York: Plenum Press.

Selye, H. (1976). The stress of life (rev. ed.). New York: McGraw-Hill.

Simon, H. A. (1976). Administrative behavior: A study of decision making processes in administrative organization (3rd ed.). New York: Free Press.

Skinner, H. A. (1977). 'The eyes that fix you': A model for classification research. Canadian Psychological Review, 18, 142-149.

Skinner, H. A. (1975). Modal profile analysis: A unified treatment of classification procedures. Unpublished doctoral dissertation, University of Western Ontario, London.

Skinner, H. A. (1978). Differentiating the contribution of elevation, scatter, and shape in profile similarity. Educational and Psychological Measurement, 38, 297-307.

Skinner, H. A., & Lei, H. (1980). Manual for modal profile analysis. Toronto: Addiction Research Foundation.

Smith, D. B. D., & Strawbridge, P. J. (1969). The heart rate response to a brief auditory and visual stimulus. Psychophysiology, 6, 317-329.

Spielberger, C. D. (1980). Test anxiety inventory ("Test attitude inventory"). Palo Alto: Consulting Psychologists.

Staddon, J. E. R. (1984). Social learning theory and the dynamics of interaction. Psychological Review, 502-507.

Stevens, J. S. (1986). Applied multivariate statistics for the social sciences. New Jersey: Lawrence Erlbaum.

Stewart, G. W. (1973). Introduction to matrix computations. New York: Academic Press.

Stewart, D., & Love, W. (1968). A general canonical index. Psychological Bulletin, 70, 160-163.

Strickland, B. R. (1978). Internal-external expectancies and health-related behaviors. Journal of Consulting and Clinical Psychology, 46, 1192-1211.

Suls, J., & Fletcher, B. (1985). The relative efficacy of avoidant and nonavoidant coping strategies: A meta-analysis. Health Psychology, 4, 249-288.

Tabachnick, B. G., & Fidell, L. S. (1989). Using multivariate statistics (2nd ed.). New York: Harper Collins.

Thompson, B. (1984). Canonical correlation analysis: Uses and interpretation. Sage University Paper Series on Quantitative Applications in the Social Sciences, 07-047. Beverly Hills: Sage Publications.

Thompson, S. C. (1981). Will it hurt less if I control it? A complex answer to a simple question. Psychological Bulletin, 90, 89-101.

Torgerson, W. S. (1958). Theory and methods of scaling. New York: John Wiley & Sons.

Townsend, J. T. (1971). Theoretical analysis of an alphabetic confusion matrix. Perception and Psychophysics, 9, 40-50.

Tucker, L. R., & Messick, S. (1963). An individual differences model for multidimensional scaling. Psychometrika, 28, 333-367.

Turpin, G., Lobstein, T., & Siddle, D. A. (1980). Phasic activity: The influence of prestimulus variability. In I. Martin & P. H. Venables (Eds.), Techniques in psychophysiology (pp. 210-217). New York: Wiley.

Tversky, A. (1969). Intransitivity of preferences. Psychological Review, 76, 31-48.

Tversky, A., & Kahneman, D. (1981). The framing of decisions and the psychology of choice. Science, 211, 453-458.

Valliant, G. E. (1977). Adaptation to life. Boston: Little, Brown.

Venables, P. H., & Christie, J. J. (1980). Electrodermal activity. In I. Martin & P. H. Venables (Eds.), Techniques in psychophysiology (pp. 3-67). New York: John Wiley & Sons.

Ventura, J., Nuechterlein, K. H., Lukoff, D., & Hardesty, J. P. (1989). A prospective study of stressful life events and schizophrenic relapse. Journal of Abnormal Psychology, 4, 407-411.

Von Neumann, J., & Morgenstern, O. (1947). Theory of games and economic behavior. Princeton: Princeton University Press.

Waid, W. M. (1979). Perceptual preparedness in man: Brief forewarning reduces electrodermal and psychophysiological response to noxious stimulation. Psychophysiology, 16, 214-221.

Ward, W. C & Jenkins, H. M. (1965). The display of information and the judgment of contingency. Canadian Journal of Psychology, 19, 231-241.

Winne, P. H. (1983). Distortions of construct validity in multiple regression analysis. Canadian Journal of Behavioral Science, 15(3), 187-202.

APPENDIX A

Instructions for the Original CR Questionnaire

NAME: ____________________

STUDENT NUMBER: __________ SEX: ___________

On the following pages you will find a series of potentially stressful situations. Accompanying each situation you also will be presented with one particular option which you can engage in.

Your task is to imagine that you will find yourself in the situation presented with the possible option indicated, then indicate, by circling one number on the scale, the **PROBABILITY OF STRESS** if you do engage in the option accompanying the situation (or in some situations, the probability of stress if you do not engage in the option accompanying the situation).

Example 1:

While cross-country skiing alone in a remote area, a severe storm suddenly hits. You do not wear a back-pack with cold weather survival equipment in it.

Probability of stress in this situation:

1	2	3	4	5
Not Probable				Very Probable

Example 2:

During an interview for a job that you need, you find yourself unprepared for many of the questions asked and perform badly. You do not make friends with persons within the company who can speak on your behalf.

Probability of stress in this situation:

1	2	3	4	5
Very Probable				Not Probable

APPENDIX B

Instructions for the Original CP Questionnaire

NAME: ____________________

STUDENT NUMBER: __________ SEX: __________

On the following pages you will find a series of potentially stressful situations. Accompanying each situation you also will be given an option which bears on the situation. You are to indicate how likely it is that you would engage in the option.

Your task is to imagine that you will find yourself in the situation presented with the possible option indicated. Then indicate, by circling ONE number on the scale, how LIKELY YOU WOULD BE TO ENGAGE IN THE OPTION ACCOMPANYING THE SITUATION.

Example 1:

While cross-country skiing alone in a remote area, a severe storm suddenly hits. You wear a back-pack with cold weather survival equipment in it.

How likely are you to engage in this option (of carrying survival equipment)?

1	2	3	4	5
Not Likely				Very Likely

Example 2:

During an interview for a job that you need, you find yourself unprepared for many of the questions asked and perform badly. You make friends with persons within the company who can speak on your behalf.

How likely are you to engage in this option (of making friends)?

1	2	3	4	5
Not Likely				Very Likely

APPENDIX C

Instructions for the Original SA Questionnaire

NAME: ____________________

STUDENT NUMBER: __________ SEX: ____________

On the following pages yo ill find a series of potentially stressful situations. Accompanying each situation you also will be presented with one particular option which you can engage in (if you elect to).

Your task is to imagine that you will find yourself in the situation presented with the possible option indicated. You may prefer to engage or not engage in the activity - you are allowed to choose whatever you wish. All things considered, indicate, by circling ONE number on the scale, how much stress you would experience in that situation.

Example 1:

While cross-country skiing alone in a remote area, a severe storm suddenly hits. You can wear back-pack with cold weather survival equipment in it.

How much stress would you experience under these circumstances?

1 2 3 4 5

No Stress Extreme Stress

Example 2:

During an interview for a job that you need, you find yourself unprepared for many of the questions asked and perform badly. You can make friends with persons within the company who can speak on your behalf.

How much stress would you experience under these circumstances?

1 2 3 4 5

Extreme Stress No Stress

APPENDIX D

Original CR, CP, and SA Questionnaire Scenarios and Coping Options

Items Representative of the Anticipatory Stress Transaction Phase:

1. **Due to economic cut-backs, there is the possibility that your present position will be redefined and your salary greatly reduced.**

   You do not convince your employer that you are able to fill a need within the company which currently is not being met.
   You do not take a course in your spare time and upgrade your qualifications in order to better your position.
   You do not volunteer to put in extra time and take on additional responsibilities.

2. **You are sexually active and have been reading recently about the growing incidence of venereal disease in your area.**

   You do not make sure that a condom is used during intercourse.
   You do not insist on fidelity within a relationship.
   You are not extremely selective about your sexual partners.

3. **The main route to your destination is through a stretch of treacherous mountain highway.**

   You take a circuitous route that is considerably longer.
   You arrange to share the driving with someone else.
   You do not take an alternative form of transportation.

4. **It is suspected that a large company has been dumping hazardous chemicals into the river system in your area.**

   You do not help to organize a public action committee to investigate the company's practices.
   You do not sell your home and move away.
   You do not bring the issue to the attention of local politicians and media.

5. **You are vacationing in the mountains with someone who tends to drive too fast and takes big risks.**

   You do not volunteer to take over the driving yourself.
   You do not volunteer to take an alternative form of transportation.
   You do not insist on being let out of the car.

6. **There is a severe flu epidemic in your place of work.**

   You get a flu vaccine.
   You make sure you get plenty of rest so you don't lower your resistance.
   You arrange to work at home as much as possible.
   You do not isolate yourself and avoid socializing until it is over.

7. **There has been a rash of burglaries in you neighbourhood and you must go out of town for several days.**

   You put all of your valuables in a safety deposit box while you are gone.
   You postpone your trip to a time when it seems safer.
   You ask a friend to stay at your place while you are away.

8. **You are alone at night in a secluded country house where strangers sometimes come to the door.**

You do not make sure that double locks are installed all the doors.
You pretend you are not at home should anyone knock.
You call the police immediately if someone knocks.

9. **An apartment you have rented is in a rough part of the city with a high incidence of muggings and assaults.**

You do not take a course in self-defense.
You walk only in well-light and crowded areas.
You do not travel by taxi to and from your home.

10. **Membership fees to join a private athletic facility have cost you several hundreds of dollars and recently you have heard that the club is about to go bankrupt.**

You research the financial status of all the private clubs in the area before joining one.
You do not organize with other members to find out what legal action is available to you in order to recover your losses.
You arrange to join a club on a short-term basis only.

11. **You are going to visit a third world country where sanitary conditions are poor.**

You do not research the area so that you are familiar with the best health-care facilities should you become ill.
You do not avoid the local food or drink only bottled water.
You stay exclusively in reputable North American hotels and resorts.

Items Representative of the "Impact" or "Post-Impact" Stress Transaction Phase:

12. **You are sailing with an inexperienced friend and have gotten caught in extremely rough water.**

You do not take a sailing course to familiarize yourself with the proper sailing techniques and safety procedures.
You read the literature on survival techniques and boating safety beforehand.
You regularly check the local marine weather reports before sailing.

13. **Circumstances have led you to break off a close relationship with someone you must interact with regularly at work.**

You make certain that you don't get personally involved with co-workers.
You do not ask your boss for a transfer.

14. **The number of cigarettes you smoke in a day has increased and lately you have developed a chronic cough.**

You do not switch to a brand of low tar and nicotine cigarette.
You limit the number of cigarettes you smoke and reward yourself for achieving your goals.
You join a "quit-smoking" group organized through your local Y.

15. **While cross country skiing in a remote area, a severe storm suddenly hits.**

You do not wear a back-pack with cold weather survival equipment in it.
You make sure that you always ski with a friend who is familiar with the terrain.
You do not notify someone beforehand of your whereabouts and arrange for them to look for you if you are not back at a predetermined time.
You make certain that you ski only in well-marked public areas.

16. **Unusual circumstances have resulted in your getting caught cheating on an exam.**

You withdraw from the course.
You admit your guilt and see if there is anything you can do to redeem yourself.
You maintain a business-like approach in your dealing with the person.
You admit your guilt and plead extenuating circumstances.

17. **Since receiving your credit card you find yourself seriously in debt.**

You arrange for a bank loan with a lower interest rate in order to pay off the credit card company.
You set up rules and limitations on your spending and adhere to them.
You cut up your credit card and continue to pay off the debit in small installments.

18. **A close long-term relationship has become stifling.**

You do not break off with the person and actively seek out other relationships.
You do not go out of your way to spend more time pursuing other interests on your own.
You do not suggest novel activities you can do with the person.

19. **During an interview for a job that you need, you find yourself unprepared for many of the questions asked and perform badly.**

You explain the situation to the employer and ask to talk with the interviewer again.
You research the company thoroughly before the interview.
You do not make friends with persons in the company who can speak on your behalf.

20. **You are driving on an unfamiliar highway and run into a severe winter storm.**

You pull over to the side of the road until it passes.
You reduce your speed and continue to the nearest rest station to wait it out.
You listen carefully to the weather reports, and, if necessary, postpone your trip.

21. **Your boss is continually making unfair demands on you.**

You do not request that a formal job description be drafted and adhered to.
You do not write down a list of specific complaints and present them to your boss.
You do not comply with the demands in order to keep your job.

22. **A friend has left town defaulting on a large loan which you co-signed and are now responsible for repaying.**

You declare personal bankruptcy making yourself exempt from repayment.
You get in touch with the person' family and try to work out a settlement.
You hire a lawyer to plead your case in court.

23. **You new position frequently requires you to deliver oral presentations to persons who are known to be highly critical.**

You do not invite criticism from friends and colleagues beforehand in order to practice your responses.
You take a course in public speaking in your spare time.
You take extra time to thoroughly research your topic prior to presentation.

24. **Personal problems have caused your performance level at work to drop dramatically.**

You do not explain the situation to your boss.
You do not seek professional help from the company's counsellor.
You do not request a leave of absence until you can get your problems sorted out.

25. **Having moved to a new city, you are finding it difficult to meet people.**

You join a club sponsoring activities that interest you.
You do not take a course that interests you.
You do not force yourself to be more independent.

APPENDIX E

CR Questionnaire

On the following pages, you will find descriptions of potentially stressful situations. Accompanying each situation will be an underlined coping option that one might use in that situation. Your task is to imagine yourself in each situation, and to indicate, using the rating scale at the top of each page as a reference, how likely you would be to experience (i.e., feel) stress if you did and did not engage in the underlined coping option. Please use the "CR Response Sheet" to record your ratings.

Example 1:

Questionnaire Booklet:

Please use the following rating scale when making your judgments:

1 - Extremely Likely
2 - Very Likely
3 - Moderately Likely
4 - Slightly Likely
5 - Neither Likely nor Unlikely
6 - Slightly Unlikely
7 - Moderately Unlikely
8 - Very Unlikely
9 - Extremely Unlikely

(i) It is midnight, and you are preparing for a four-hour medical school admissions exam which takes place in the morning. You come across an important set of notes which you still do not understand. You can stay up all night and attempt to learn the material as thoroughly as possible.

How likely would you be to experience stress if you:

(a) DID engage in the underlined option?

(b) DID NOT engage in the underlined option?

Response Sheet:

Likelihood of Stress if you:

	DID Engage	DID NOT Engage
(i)	2	1

This judge has indicated that he/she would be "Very Likely" to experience stress if he/she did engage in the underlined coping option (i.e., staying up all night). This has been indicated by the rating of "2" in the "DID Engage" column on the response sheet. He/she has also indicated that he/she would be "Extremely Likely" to experience stress if he/she did not engage in the underlined coping option. This has been indicated by the rating of "1" in the "DID NOT Engage" column on the response sheet. You may have responded differently.

Example 2:

Questionnaire Booklet:

Please use the following rating scale in making your judgments:

1 - Extremely Unlikely
2 - Very Unlikely
3 - Moderately Unlikely
4 - Slightly Unlikely
5 - Neither Unlikely nor Likely
6 - Slightly Likely
7 - Moderately Likely
8 - Very Likely
9 - Extremely Likely

(ii) You are driving into a busy airport terminal to catch a flight that leaves in 30 minutes. Up ahead, you see what appears to be a traffic jam. You can pay one of the parking attendants $35 to park your car.

How likely would you be to experience stress if you:

(a) DID engage in the underlined option?

(b) DID NOT engage in the underlined option?

Response Sheet:

Likelihood of Stress if you:

	DID Engage	DID NOT Engage
(ii)	6	9

This judge has indicated that he/she would be "Slightly Likely" to experience stress if he/she did engage in the underlined coping option (i.e., paying the attendant to park the car). This has been indicated by the rating of "6" in the "DID Engage" column on the response sheet. He/she also has indicated that he/she would be "Extremely Likely" to experience stress if he/she did not engage in the underlined coping option. This has been indicated by the rating of "9" in the "DID NOT Engage" column of the response sheet. Again, you may have responded differently.

CIRCUMSTANCES

Please use the following rating scale when making your judgments:

1 - Extremely Likely
2 - Very Likely
3 - Moderately Likely
4 - Slightly Likely
5 - Neither Likely nor Unlikely
6 - Slightly Unlikely
7 - Moderately Unlikely
8 - Very Unlikely
9 - Extremely Unlikely

---

1. While cross-country skiing in a remote area, you hear on your transistor radio that a severe storm may soon hit. You can contact the weather station via walkie-talkie and notify them of your whereabouts.

   How likely would you be to experience stress if you:

   (a) DID engage in the underlined option?

   (b) DID NOT engage in the underlined option?

2. You are sailing with an inexperienced friend in waters that at times, can become extremely rough. You can put on a life jacket.

   How likely would you be to experience stress if you:

   (a) DID engage in the underlined option?

   (b) DID NOT engage in the underlined option?

3. You hear that a large company will be dumping hazardous chemicals into the river system in your area. You can sell your home and move away.

   How likely would you be to experience stress if you:

   (a) DID engage in the underlined option?

   (b) DID NOT engage in the underlined option?

4. You will be driving in the mountains with someone who has a reputation for being reckless. You can confront the driver regarding his/her dangerous reputation.

   How likely would you be to experience stress if you:

   (a) DID engage in the underlined option?

   (b) DID NOT engage in the underlined option?

Please use the following rating scale in making your judgments:

1 - Extremely Likely
2 - Very Likely
3 - Moderately Likely
4 - Slightly Likely
5 - Neither Likely Nor Unlikely
6 - Slightly Unlikely
7 - Moderately Unlikely
8 - Very Unlikely
9 - Extremely Unlikely

---

5. Having moved to a new city, you worry that you may find it difficult to meet people. You can join a club sponsoring activities that interest you.

How likely would you be to experience stress if you:

(a) DID engage in the underlined option?

(b) DID NOT engage in the underlined option?

6. You are sexually active and have been reading recently about the growing incidence of venereal disease in your area. You can make sure that a condom is used during intercourse.

How likely would you be to experience stress if you:

(a) DID engage in the underlined option?

(b) DID NOT engage in the underlined option?

7. The number of cigarettes you smoke in a day has increased and lately, you have developed what appears to be a chronic cough. You can join a "quit smoking" group organized through your local Y.

How likely would you be to experience stress if you:

(a) DID engage in the underlined option?

(b) DID NOT engage in the underlined option?

8. There is a severe flu epidemic at your place of work which so far, has left you unaffected. You can get a flu vaccine.

How likely would you be to experience stress if you:

(a) DID engage in the underlined option?

(b) DID NOT engage in the underlined option?

Please use the following rating scale in making your judgments:

1 - Extremely Likely
2 - Very Likely
3 - Moderately Likely
4 - Slightly Likely
5 - Neither Likely Nor Unlikely
6 - Slightly Unlikely
7 - Moderately Unlikely
8 - Very Unlikely
9 - Extremely Unlikely

---

9. Word has it that your boss is going to ask you to work over the Christmas holidays and you feel that this is an unfair demand. You can arrange a meeting with him to discuss the issue.

   How likely would you be to experience stress if you:

   (a) DID engage in the underlined option?

   (b) DID NOT engage in the underlined option?

10. You hear that a large company is going to be dumping hazardous chemicals into the river system in your area. You can help to organize a public action committee to investigate the company's practices.

   How likely would you be to experience stress if you:

   (a) DID engage in the underlined option?

   (b) DID NOT engage in the underlined option?

11. You are driving on an unfamiliar highway and sense, from the look of the sky, that you may soon run into a severe winter storm. You can pull over and get your road flares out of the trunk.

   How likely would you be to experience stress if you:

   (a) DID engage in the underlined option?

   (b) DID NOT engage in the underlined option?

12. The main route to your destination is through a stretch of treacherous mountain highway. You can take an alternative form of transportation.

   How likely would you be to experience stress if you:

   (a) DID engage in the underlined option?

   (b) DID NOT engage in the underlined option?

Please use the following rating scale in making your judgments:

1 - Extremely Likely
2 - Very Likely
3 - Moderately Likely
4 - Slightly Likely
5 - Neither Likely Nor Unlikely
6 - Slightly Unlikely
7 - Moderately Unlikely
8 - Very Unlikely
9 - Extremely Unlikely

---

13. Prior to an interview for a job that you need, and are highly qualified for, you realize that you are not as prepared as you would like to be and fear that you may perform badly. You can explain the situation to the employer and request another interview.

    How likely would you be to experience stress if you:

    (a) DID engage in the underlined option?

    (b) DID NOT engage in the underlined option?

14. Your new position will frequently require you to deliver oral presentations to persons who are known to be highly critical. You can invite criticism from your friends and colleagues in order to practice your responses.

    How likely would you be to experience stress if you:

    (a) DID engage in the underlined option?

    (b) DID NOT engage in the underlined option?

15. Due to economic cut-backs, there is a good possibility that your present position will be redefined and your salary greatly reduced. You can make your position seem more valuable by convincing your employer that you are able to fill a need within the company which currently is not being met.

    How likely would you be to experience stress if you:

    (a) DID engage in the underlined option?

    (b) DID NOT engage in the underlined option?

Please use the following rating scale in making your judgments:

1 - Extremely Likely
2 - Very Likely
3 - Moderately Likely
4 - Slightly Likely
5 - Neither Likely Nor Unlikely
6 - Slightly Unlikely
7 - Moderately Unlikely
8 - Very Unlikely
9 - Extremely Unlikely

---

16. Membership fees to join a private athletic facility have cost you several thousands of dollars. Recently you have heard that the club is about to go bankrupt. You can research the financial status of the club.

    How likely would you be to experience stress if you:

    (a) DID engage in the underlined option?

    (b) DID NOT engage in the underlined option?

17. You are alone at night in a secluded country house where strangers sometimes come to the door. You can make sure that the doors are locked before settling down to watch TV.

    How likely would you be to experience stress if you:

    (a) DID engage in the underlined option?

    (b) DID NOT engage in the underlined option?

18. A close long-term relationship appears as if it may become stifling. You can suggest novel activities that you can do with the person.

    How likely would you be to experience stress if you:

    (a) DID engage in the underlined option?

    (b) DID NOT engage in the underlined option?

19. Word has it that your boss is going to ask you to work over the Christmas holidays and you feel that this is an unfair demand. You can write him a memo outlining the holidays you still have owing.

    How likely would you be to experience stress if you:

    (a) DID engage in the underlined option?

    (b) DID NOT engage in the underlined option?

Please use the following rating scale in making your judgments:

1 - Extremely Likely
2 - Very Likely
3 - Moderately Likely
4 - Slightly Likely
5 - Neither Likely Nor Unlikely
6 - Slightly Unlikely
7 - Moderately Unlikely
8 - Very Unlikely
9 - Extremely Unlikely

---

20. Since receiving your credit card you worry that you may be seriously in debt. You can set up rules and limitations on your spending and begin to adhere to them.

    How likely would you be to experience stress if you:

    (a) DID engage in the underlined option?

    (b) DID NOT engage in the underlined option?

21. Circumstances suggest that you will soon have to break off a close relationship with someone you interact with regularly at work. you can ask your boss for a transfer.

    How likely would you be to experience stress if you:

    (a) DID engage in the underlined option?

    (b) DID NOT engage in the underlined option?

22. A friend has left town, apparently defaulting on a large bank loan which you co-signed. You feel that you may now be responsible for repaying the loan. You can declare personal bankruptcy, thereby making yourself exempt from repayment.

    How likely would you be to experience stress if you:

    (a) DID engage in the underlined option?

    (b) DID NOT engage in the underlined option?

Please use the following rating scale in making your judgments:

1 - Extremely Unlikely
2 - Very Unlikely
3 - Moderately Unlikely
4 - Slightly Unlikely
5 - Neither Unlikely Nor Likely
6 - Slightly Likely
7 - Moderately Likely
8 - Very Likely
9 - Extremely Likely

---

23. An apartment you have rented is in a rough part of the city with a high incidence of muggings and assaults. You can take a course in self-defense.

    How likely would you be to experience stress if you:

    (a) DID engage in the underlined option?

    (b) DID NOT engage in the underlined option?

24. The main route to your destination is through a stretch of treacherous mountain highway. You can take an alternative circuitous route that is considerably longer.

    How likely would you be to experience stress if you:

    (a) DID engage in the underlined option?

    (b) DID NOT engage in the underlined option?

25. Having moved to a new city, you worry that you may find it difficult to meet people. You can immediately introduce yourself to all your nearest neighbours.

    How likely would you be to experience stress if you:

    (a) DID engage in the underlined option?

    (b) DID NOT engage in the underlined option?

26. Personal problems are escalating to the point where they may soon interfere with your performance at work. You can seek professional help from the company's counsellor.

    How likely would you be to experience stress if you:

    (a) DID engage in the underlined option?

    (b) DID NOT engage in the underlined option?

Please use the following rating scale in making your judgments:

1 - Extremely Unlikely
2 - Very Unlikely
3 - Moderately Unlikely
4 - Slightly Unlikely
5 - Neither Unlikely Nor Likely
6 - Slightly Likely
7 - Moderately Likely
8 - Very Likely
9 - Extremely Likely

---

27. You are going to visit a third world country where sanitary conditions are poor. <u>You can research the area so that you are familiar with the best health-care facilities should you become ill</u>.

    How likely would you be to experience stress if you:

    (a) <u>DID</u> engage in the underlined option?

    (b) <u>DID</u> <u>NOT</u> engage in the underlined option?

28. You are sexually active and have been reading recently about the growth incidence of venereal disease in your area. <u>You can insist on fidelity within your relationship</u>.

    How likely would you be to experience stress if you:

    (a) <u>DID</u> engage in the underlined option?

    (b) <u>DID</u> <u>NOT</u> engage in the underlined option?

29. Circumstances suggest that you will soon have to break off a close relationship with someone you interest with regularly at work. <u>You can seek advice from close co-workers</u>.

    How likely would you be to experience stress if you:

    (a) <u>DID</u> engage in the underlined option?

    (b) <u>DID</u> <u>NOT</u> engage in the underlined option?

Please use the following rating scale in making your judgments:

1 - Extremely Unlikely
2 - Very Unlikely
3 - Moderately Unlikely
4 - Slightly Unlikely
5 - Neither Unlikely Nor Likely
6 - Slightly Likely
7 - Moderately Likely
8 - Very Likely
9 - Extremely Likely

---

30. There has been a rash of burglaries in your neighbourhood and you must go out of town for several days. <u>You can have your valuables stored in a safety deposit box</u>.

    How likely would you be to experience stress if you:

    (a) <u>DID</u> engage in the underlined option?

    (b) <u>DID</u> <u>NOT</u> engage in the underlined option?

31. A close long-term relationship appears as if it may become stifling. <u>You can break off with the person and actively seek out other relationships</u>.

    How likely would you be to experience stress if you:

    (a) <u>DID</u> engage in the underlined option?

    (b) <u>DID</u> <u>NOT</u> engage in the underlined option?

32. While cross-country skiing in a remote area, you hear on your transistor radio that a severe storm may soon hit. <u>You can stop skiing and seek out a place of shelter</u>.

    How likely would you be to experience stress if you:

    (a) <u>DID</u> engage in the underlined option?

    (b) <u>DID</u> <u>NOT</u> engage in the underlined option?

33. Rumour has it that your are going to be confronted by your favourite professor about cheating on an exam. <u>You can withdraw from the course</u>.

    How likely would you be to experience stress if you:

    (a) <u>DID</u> engage in the underlined option?

    (b) <u>DID</u> <u>NOT</u> engage in the underlined option?

Please use the following rating scale in making your judgments:

1 - Extremely Unlikely
2 - Very Unlikely
3 - Moderately Unlikely
4 - Slightly Unlikely
5 - Neither Unlikely Nor Likely
6 - Slightly Likely
7 - Moderately Likely
8 - Very Likely
9 - Extremely Likely

---

34. Due to economic cut-backs, there is a good possibility that your present position will be redefined and your salary greatly reduced. You can volunteer to put in extra time and take on additional responsibilities.

    How likely would you be to experience stress if you:

    (a) DID engage in the underlined option?

    (b) DID NOT engage in the underlined option?

35. You are sailing with an inexperienced friend in waters that at times, can become extremely rough. You can check the local marine weather reports regularly.

    How likely would you be to experience stress if you:

    (a) DID engage in the underlined option?

    (b) DID NOT engage in the underlined option?

36. You are alone at night in a secluded country house where strangers sometimes come to the door. You can post the telephone number of the police department immediately next to your phone.

    How likely would you be to experience stress if you:

    (a) DID engage in the underlined option?

    (b) DID NOT engage in the underlined option?

37. The number of cigarettes you smoke in a day has increased and lately, you have developed what appears to be a chronic cough. You can switch to a brand of low tar and nicotine cigarette.

    How likely would you be to experience stress if you:

    (a) DID engage in the underlined option?

    (b) DID NOT engage in the underlined option?

Please use the following rating scale in making your judgments:

1 - Extremely Unlikely
2 - Very Unlikely
3 - Moderately Unlikely
4 - Slightly Unlikely
5 - Neither Unlikely Nor Likely
6 - Slightly Likely
7 - Moderately Likely
8 - Very Likely
9 - Extremely Likely

---

38. Your new position will frequently require you to deliver oral presentations to persons who are know to be highly critical. You can arrange to take a course in public speaking in your spare time.

How likely would you be to experience stress if you:

(a) DID engage in the underlined option?

(b) DID NOT engage in the underlined option?

39. Personal problems are escalating to the point where they may soon interfere with your performance at work. You can request a leave of absence until you can get your problems sorted out.

How likely would you be to experience stress if you:

(a) DID engage in the underlined option?

(b) DID NOT engage in the underlined option?

40. You will be driving in the mountains with someone who has a reputation for being reckless. You can volunteer to take over the driving yourself.

How likely would you be to experience stress if you:

(a) DID engage in the underlined option?

(b) DID NOT engage in the underlined option?

Please use the following rating scale in making your judgments:

1 - Extremely Unlikely
2 - Very Unlikely
3 - Moderately Unlikely
4 - Slightly Unlikely
5 - Neither Unlikely Nor Likely
6 - Slightly Likely
7 - Moderately Likely
8 - Very Likely
9 - Extremely Likely

---

41. A friend has left town, apparently defaulting on a large bank loan which you co-signed. You feel that you may now be responsible for repaying the loan. You can get in touch with the person's family and try to work out a settlement.

How likely would ycu be to experience stress if you:

(a) DID engage in the underlined option?

(b) DID NOT engage in the underlined option?

42. Prior to an interview for a job that you need, and are highly qualified for, you realize that you are not as prepared as you would like to be and fear that you may perform badly. You can explain the situation to the employer and request another interview.

How likely would you be to experience stress if you:

(a) DID engage in the underlined option?

(b) DID NOT engage in the underlined option?

43. You are driving on an unfamiliar highway and sense, from the look of the sky, that you may soon run into a severe winter storm. You can check your road atlas to determine the location of the nearest service station.

How likely would you be to experience stress if you:

(a) DID engage in the underlined option?

(b) DID NOT engage in the underlined option?

Please use the following rating scale in making your judgments:

1 - Extremely Unlikely
2 - Very Unlikely
3 - Moderately Unlikely
4 - Slightly Unlikely
5 - Neither Unlikely Nor Likely
6 - Slightly Likely
7 - Moderately Likely
8 - Very Likely
9 - Extremely Likely

---

44. Since receiving your credit card you worry that you may be seriously in debt. You can cut up your credit card.

How likely would you be to experience stress if you:

(a) DID engage in the underlined option?

(b) DID NOT engage in the underlined option?

45. There has been a rash of burglaries in you neighbourhood and you must go out of town for several days. You can postpone your trip until a time when it seems safer.

How likely would you be to experience stress if you:

(a) DID engage in the underlined option?

(b) DID NOT engage in the underlined option?

46. Membership fees to join a private athletic facility have cost you several thousands of dollars. Recently you have heard that the club is about to go bankrupt. You can organize with other members to find out what legal action is available to you in order to recover your losses.

How likely would you be to experience stress if you:

(a) DID engage in the underlined option?

(b) DID NOT engage in the underlined option?

47. You are going to visit a third world country where sanitary conditions are poor. You can make arrangements to stay exclusively in reputable North American hotels and resorts.

How likely would you be to experience stress if you:

(a) DID engage in the underlined option?

(b) DID NOT engage in the underlined option?

Please use the following rating scale in making your judgments:

1 - **Extremely Unlikely**
2 - **Very Unlikely**
3 - **Moderately Unlikely**
4 - **Slightly Unlikely**
5 - **Neither Unlikely Nor Likely**
6 - **Slightly Likely**
7 - **Moderately Likely**
8 - **Very Likely**
9 - **Extremely Likely**

---

48. Rumour has it that you are going to be confronted by your favourite professor about cheating on an exam. You can plead guilty and see if there is anything you can do to redeem yourself.

How likely would you be to experience stress if you:

(a) DID engage in the underlined option?

(b) DID NOT engage in the underlined option?

49. There is a severe flu epidemic in your place of work which so far, has left you unaffected. You can make arrangements to work at home as much as possible.

How likely would you be to experience stress if you:

(a) DID engage in the underlined option?

(b) DID NOT engage in the underlined option?

50. An apartment you have rented is in a rough part of the city with a high incidence of muggings and assaults. You can walk only in well-lighted and crowded areas.

How likely would you be to experience stress if you:

(a) DID engage in the underlined option?

(b) DID NOT engage in the underlined option?

APPENDIX F

CL Questionnaire

On the following pages, you will find descriptions of potentially stressful situations. Accompanying each situation will be an underlined coping option that one might use in that situation. Your task is to imagine yourself in each situation, and to indicate, using the rating scale at the top of each page as a reference, how likely you would be to engage in the underlined coping option if you were in that situation. Please use the "CL Response Sheet" to record your ratings.

Example 1:

Questionnaire Booklet:

Please use the following rating scale when making your judgments:

1 - Extremely Likely
2 - Very Likely
3 - Moderately Likely
4 - Slightly Likely
5 - Neither Likely nor Unlikely
6 - Slightly Unlikely
7 - Moderately Unlikely
8 - Very Unlikely
9 - Extremely Unlikely

(i) It is midnight, and you are preparing for a four-hour medical school admissions exam which takes place in the morning. You come across an important set of notes which you still do not understand. You can stay up all night and attempt to learn the material as thoroughly as possible.

How likely would you be to engage in the underlined option?

Response Sheet:

Likelihood of
Engaging in the
Underlined Option

(i) 1

This judge has indicated that he/she would be "Extremely Likely" to engage in the underlined coping option (i.e., staying up all night). This has been indicated by the rating of "1" on the CL response sheet. You may have responded differently.

Example 2:

Questionnaire Booklet:

Please use the following rating scale in making your judgments:

1 - Extremely Unlikely
2 - Very Unlikely
3 - Moderately Unlikely
4 - Slightly Unlikely
5 - Neither Unlikely nor Likely
6 - Slightly Likely
7 - Moderately Likely
8 - Very Likely
9 - Extremely Likely

(ii) You are driving into a busy airport terminal to catch a flight that leaves in 30 minutes. Up ahead, you see what appears to be a traffic jam. You can pay one of the parking attendants $35 to park your car.

How likely would you be to engage in the underlined option?

Response Sheet:

Likelihood of
Engaging in th~
Underlined Option

(ii) 3

This judge has indicated that he/she would be "Moderately Unlikely" to engage in the underlined coping option (i.e., paying the attendant to park the car). This has been indicated by the rating of "3" on the CL response sheet. Again, you may have responded differently.

Be sure to make rating for each situation. If you are unsure of a rating, make the best guess you can, but do not leave any items blank.

APPENDIX G

SA Questionnaire

On the following pages, you will find descriptions of potentially stressful situations. Accompanying each situation will be an underlined coping option that one might use in that situation. Your task is to indicate, based on all things considered, how much stress/relaxation you would experience in that situation. Please use the rating scale at the top of each page as a reference for your ratings. Record these ratings on the "SA Response Sheet" in the column titled "Degree of Stress".

Example 1:

Questionnaire Booklet:

Please use the following rating scale when making your judgments:

1 - Extreme Stress
2 - Considerable Stress
3 - Moderate Stress
4 - Slight Stress
5 - Neither Stress Nor Relaxation
6 - Slight Relaxation
7 - Moderate Relaxation
8 - Considerable Relaxation
9 - Extreme Relaxation

(i) It is midnight, and you are preparing for a four-hour medical school admissions exam which takes place in the morning. You come across an important set of notes which you still do not understand. You can stay up all night and attempt to learn the material as thoroughly as possible.

All things considered, how much stress/relaxation would you feel in this situation?

Response Sheet:

	Degree of Stress
(i)	3

This judge has indicated that, all things considered, he/she would experience "Moderate Stress" in this situation. This has been indicated by the rating of "3" in the "Degree of Stress" column on the SA response sheet. You may have responded differently.

<u>Example 2</u>:

<u>Questionnaire Booklet</u>:

Please use the following rating scale in making your judgments:

1 - Extreme Relaxation
2 - Considerable Relaxation
3 - Moderate Relaxation
4 - Slight Relaxation
5 - Neither Relaxation Nor Stress
6 - Slight Stress
7 - Moderate Stress
8 - Considerable Stress
9 - Extreme Stress

(ii) You are driving into a busy airport terminal to catch a flight that leaves in 30 minutes. Up ahead, you see what appears to be a traffic jam. <u>You can pay one of the parking attendants $35 to park your car</u>.

All things considered, how much stress/relaxation would you feel in this situation?

<u>Response Sheet</u>:

Degree of Stress

(i) 8

This judge has indicated that, all things considered, he/she would experience "Considerable Stress" in this situation. This has been indicated by the rating of "8" in the "Degree of Stress" column on the response sheet. Again, you may have responded differently.

Be sure to make a rating for <u>each</u> situation. If you are unsure of a rating, make the best guess you can, but <u>do not</u> leave any items blank.

APPENDIX H

CR Response Sheet

Likelihood of Stress if you:

	DID Engage	DID NOT Engage	
1.	_____	_____	
2.	_____	_____	
3.	_____	_____	
4.	_____	_____	
5.	_____	_____	
6.	_____	_____	
7.	_____	_____	
8.	_____	_____	
9.	_____	_____	
10.	_____	_____	
11.	_____	_____	
12.	_____	_____	
13.	_____	_____	
14.	_____	_____	
15.	_____	_____	
16.	_____	_____	
17.	_____	_____	
18.	_____	_____	
19.	_____	_____	
20.	_____	_____	
21.	_____	_____	
22.	_____	_____	
23.	_____	_____	*
24.	_____	_____	*
25.	_____	_____	*
26.	_____	_____	*
27.	_____	_____	
28.	_____	_____	
29.	_____	_____	

Likelihood of Stress if you:

	DID Engage	DID NOT Engage	
30.	_____	_____	*
31.	_____	_____	*
32.	_____	_____	*
33.	_____	_____	*
34.	_____	_____	*
35.	_____	_____	*
36.	_____	_____	*
37.	_____	_____	*
38.	_____	_____	*
39.	_____	_____	*
40.	_____	_____	*
41.	_____	_____	*
42.	_____	_____	*
43.	_____	_____	*
44.	_____	_____	*
45.	_____	_____	*
46.	_____	_____	*
47.	_____	_____	*
48.	_____	_____	*
49.	_____	_____	*
50.	_____	_____	*

Name: ____________

Student #: ________

Sex: M ____ F ____

Order: ___________

<u>Note</u>: Asterisks (*) represent items with reversed rating scales.

APPENDIX I

CL Response Sheet

Item	Likelihood of Engaging in the Underlined Option		Item	Likelihood of Engaging in the Underlined Option	
1.	____		31.	____	
2.	____		32.	____	
3.	____	(7)	33.	____	(1)
4.	____		34.	____	
5.	____		35.	____	
6.	____		36.	____ *	
7.	____	(4)	37.	____ *	
8.	____		38.	____ *	(3)
9.	____		39.	____ *	
10.	____		40.	____ *	
11.	____ *		41.	____ *	
12.	____ *		42.	____ *	
13.	____ *	(10)	43.	____ *	(8)
14.	____ *		44.	____ *	
15.	____ *		45.	____ *	
16.	____		46.	____ *	
17.	____		47.	____ *	
18.	____	(2)	48.	____ *	(5)
19.	____		49.	____ *	
20.	____		50.	____ *	
21.	____				
22.	____				
23.	____	(6)			
24.	____				
25.	____				
26.	____ *				
27.	____ *				
28.	____ *	(9)			
29.	____ *				
30.	____ *				

Name: ____________________

Student Number: __________

Sex: M ___ F ___

Date: ____________________

Order: ____________________

Note: Asterisks (*) represent items with reversed rating scales.

APPENDIX J

SA Response Sheet

Degree of Stress

1. ______
2. ______ (11)
3. ______

4. ______ *
5. ______ * (8)
6. ______ *

7. ______ *
8. ______ *
9. ______ * (1)
10. ______ *

11. ______ *
12. ______ *
13. ______ * (2)
14. ______ *

15. ______
16. ______
17. ______ (10)
18. ______

19. ______
20. ______ (14)
21. ______

22. ______ *
23. ______ *
24. ______ * (3)
25. ______ *

26. ______
27. ______ (12)
28. ______

Degree of Stress

29. ______ *
30. ______ * (6)
31. ______ *

32. ______ *
33. ______ * (4)
34. ______ *

35. ______
36. ______
37. ______ (7)
38. ______

39. ______
40. ______
41. ______ (13)
42. ______

43. ______
44. ______
45. ______ (9)
46. ______

47. ______ *
48. ______ *
49. ______ * (5)
50. ______ *

Name: ____________________

Student Number: ____________

Sex: M ___ F ___

Date: ____________________

Order: ____________________

Note: Asterisks (*) represent items with reversed rating scales.

APPENDIX K

Random Orderings of the 85 Learning Trial Letter-Outcome Pairs

Order 1

1. L
2. M*
3. G
4. P*
5. Z
6. A*
7. P
8. Z*
9. V*
10. L*

11. J
12. V*
13. P*
14. Z
15. G*
16. J
17. G*
18. V
19. A*
20. L

21. M
22. P
23. Z
24. P*
25. P
26. M*
27. V*
28. V
29. Z
30. Z*

31. P
32. M
33. V
34. P*
35. G*
36. Z
37. V*
38. M
39. V*
40. J*

41. M
42. J
43. Z
44. P*
45. Z*
46. P
47. V
48. Z*
49. P
50. P

51. V*
52. J
53. Z
54. G*
55. Z*
56. G
57. Z
58. P*
59. G
60. A*

61. L*
62. A
63. M
64. G*
65. G*
66. P
67. G*
68. J
69. J
70. P*

71. M
72. A*
73. G
74. G*
75. J
76. P
77. Z*
78. P
79. V*
80. J

81. P*
82. M
83. G*
84. A
85. L

Order 2

1. P
2. V
3. Z
4. M
5. G*
6. V
7. J
8. Z
9. A*
10. P*

11. G
12. M
13. J
14. P*
15. V*
16. J
17. Z*
18. L
19. J
20. P

21. J
22. Z*
23. G*
24. Z
25. M*
26. V*
27. P*
28. J
29. A*
30. G*

31. M
32. P
33. J
34. V*
35. Z
36. G*
37. P
38. J*
39. L*
40. A

41. P
42. Z*
43. L
44. P*
45. V*
46. A*
47. G
48. Z*
49. M
50. L*

51. P
52. G
53. Z
54. M
55. V
56. P*
57. M
58. V*
59. G*
60. A*

61. V*
62. Z
63. G*
64. L
65. G*
66. P
67. G
68. A
69. Z*
70. V

71. P
72. P
73. M*
74. M
75. P*
76. J
77. Z*
78. V*
79. P
80. G*

81. Z
82. P*
83. Z
84. G*
85. P*

Order 3

1. Z
2. P*
3. V
4. M
5. G
6. J
7. G*
8. L*
9. Z
10. P*

11. G*
12. P
13. G
14. A*
15. M
16. V*
17. P
18. Z*
19. P
20. G*

21. P*
22. P
23. V
24. A*
25. V*
26. P
27. M
28. J
29. P
30. V*

31. G*
32. Z
33. L*
34. G
35. Z*
36. J
37. P*
38. Z
39. P*
40. M*

41. G*
42. J
43. P
44. Z
45. P*
46. A*
47. G*
48. M
49. Z
50. L

51. Z
52. J*
53. V*
54. V*
55. M
56. G*
57. A
58. Z*
59. G*
60. J

61. Z*
62. P*
63. J
64. A*
65. M
66. L
67. G*
68. V*
69. Z
70. P

71. Z*
72. V*
73. P
74. A
75. Z*
76. G
77. V
78. J
79. P*
80. M*

81. P
82. J
83. V
84. M
85. L

APPENDIX L

Random Orderings of the Letter Stimuli for the Judgment Trials

Order 1

1.	M
2.	A
3.	Z
4.	V
5.	L
6.	G
7.	J
8.	P

Order 2

1.	P
2.	V
3.	Z
4.	J
5.	L
6.	A
7.	M
8.	G

Order 3

1.	[illegible]
2.	A
3.	M
4.	P
5.	G
6.	Z
7.	J
8.	V

APPENDIX M

<u>Rating Scales for Estes Paradigm Judgment Trials</u>

Subject Number: _____

Date: _____

Judgment Trial: _____

Order #: _____

1. 0 ________________ 25 ________________ 50 ________________ 75 ________________ 100

2. 0 ________________ 25 ________________ 50 ________________ 75 ________________ 100

3. 0 ________________ 25 ________________ 50 ________________ 75 ________________ 100

4. 0 ________________ 25 ________________ 50 ________________ 75 ________________ 100

5. 0 ________________ 25 ________________ 50 ________________ 75 ________________ 100

6. 0 ________________ 25 ________________ 50 ________________ 75 ________________ 100

7. 0 ________________ 25 ________________ 50 ________________ 75 ________________ 100

8. 0 ________________ 25 ________________ 50 ________________ 75 ________________ 100

APPENDIX N

Computer Screen Replicas for Phase 2 Experimental Trials

READY

All things considered, how much stress do you think you'll feel if you <u>do</u> engage in active tapping? (0 = No Stress, 100 = Extreme Stress)

All things considered, how much stress do you think you'll feel if you <u>do</u> <u>not</u> engage in active tapping? (0 = No Stress, 100 = Extreme Stress)

All things considered, how motivated do you feel to engage in active tapping? (0 = Not at All Motivated, 100 = Extremely Motivated)

All things considered, how tense do you feel when you think of the upcoming Go-Stop period? (0 = Not at all Tense, 100 = Extremely Tense)

READY TO TAP

GO

STOP

APPENDIX O

Random Orderings of the Letter Stimuli for the Experimental Trials

Order 1		Order 2		Order 3	
1.	J	1.	P	1.	A
2.	Z	2.	S	2.	S
3.	L	3.	G	3.	M
4.	V	4.	R	4.	Z
5.	R	5.	A	5.	G
6.	G	6.	V	6.	J
7.	M	7.	J	7.	V
8.	P	8.	M	8.	R
9.	S	9.	Z	9.	L
10.	A	10.	L	10.	P