

EXTRAVERSION-INTROVERSION AND EMOTIONALITY  
AS PROPOSED SUPERORDINATE STRESS MODERATORS:  
DEVELOPMENT AND APPLICATION USING  
PROTOTYPE THEORY AS A POTENTIAL MODEL

CENTRE FOR NEWFOUNDLAND STUDIES

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Extraversion-Introversion and Emotionality  
as Proposed Superordinate Stress Moderators:  
Development and Application Using  
Prototype Theory as a Potential Model

By

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### Abstract

A superordinate stress moderator model was developed around the cognitive theory of prototypes. It was proposed that both extraversion-introversion and emotionality would serve as two superordinate moderators, buffering the curvilinear effects of daily stress on physical symptoms. Approximately 714 subjects were administered measures of stress, perceived physical symptoms, extraversion-introversion, emotionality, sense of coherence, sense of humour, dispositional optimism, and psychological hardiness during the first wave of a two wave prospective study. Four weeks later, 510 of the original subjects completed a similar measure of daily stress and symptoms. The results failed to support the superordinate hypotheses for either extraversion-introversion or emotionality. Subsequent model comparisons revealed that a pure main effects model best fit the data in that sex of participant, prior physical symptoms, daily stress, emotionality, and sense of humour were all significant in predicting the wave two symptoms criterion. Suggestions for future research are discussed.

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In addition, thanks are also extended to Carla Krachun for use of her hassle-symptom data set and to Paul Bateman for taking the time to enter wave one of the data base. Above and beyond the call of duty Paul.

### Dedication

Most of all I would like to thank my brothers, Bill, Peter, and Robert for their support over the years. Words cannot capture what their physical and spiritual presence has meant to me in my lifetime. I certainly would not be where I am without them. It is with these words that I dedicate this document to them. Thanks guys.

Dave

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## List of Symbols and Abbreviations

M = Mean/Average

SD = Standard Deviation

z = Standard Score ( $(X-M)/S.D.$ )

$h^2$  = Communality

r = Correlation Coefficient

$R^2$  = Multiple R-Square

b = Unstandardized Regression Coefficient

B = Standardized Regression Coefficient

p = Probability Level (Alpha)

F = F-Ratio

ns = Not Statistically Significant



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## Introduction

One of the most distinctive features of contemporary research on stress has been its emphasis on the relationship between stressful life events and health outcome (Kanner, Coyne, Schaefer, & Lazarus, 1981; Monroe, 1982). Much of the research that has emerged has tested the predictive utility of major life events on such outcomes as schizophrenia, depression, cancer, and death of the elderly (Lazarus & Folkman, 1984). However, as Taylor (1986) points out, correlations between life events and well-being have usually accounted for no more than nine percent of the variance. This has led to the notion that some individuals are more resilient than others under equivalent stress indices.

More specifically, to explain why some individuals are less vulnerable to illness than others when experiencing similar levels of stress, both intra- and interpersonal characteristics have been proposed as diagnostic and prognostic influences. These characteristics have been referred to as stress moderators, resistance or resilience factors, resources, or buffering variables. As defined for the purposes of this research, moderator variables are

referred to here as antecedent, internal, or external resources which are assumed to interact with to influence the magnitude and direction of the relationship between stress and health. Moderators can take many forms. Generally, these include biologic or genetic variables (e.g., gender), personality traits (e.g., sense of competence), and interpersonal characteristics (e.g., social support). The stress moderator model is conceptualized in Figure 1.

In terms of process, moderator variables are assumed to affect the stress/illness relationship in essentially two ways (See Figure 2). First, a resource may influence the stress process by preventing or attenuating a cognitive stress appraisal. The second route where resources may impact occurs between subsequent threat/stress appraisals and prior to the onset of a pathological response. Essentially, the resource intervenes in this process by influencing either a cognitive reappraisal of the situation, or by facilitating the activation of more adaptive coping strategies. Despite the growing interest in moderator research, two general issues cloud this field, lack of meaningful theoretical framework, and resource redundancy.

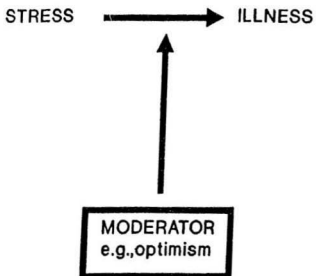


Figure 1. Stress moderator model:  
Conceptual representation  
(Adapted from Baron & Kenny).

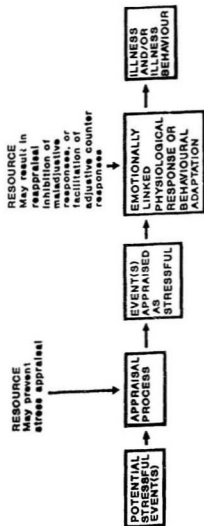


Figure 2. The impact of moderators within the stress process  
(Adapted from Cohen & Wills, 1985).

### Concerns with Stress Moderator Research

1. Lack of Meaningful Theoretical Framework. As alluded to previously, the last few years have witnessed an explosion in moderator research. Examples of such buffers include dispositional optimism (Scheier & Carver, 1985), exercise (Kobasa, Maddi, & Puccetti, 1983), locus of control (Sandler & Lakey, 1982), physical fitness (Brown, 1991; Roth & Holmes, 1985; Roth, Wiebe, Fillingham, & Shay, 1989; Tucker & Cole, 1986), potency (Ben-Sira, 1985), psychological hardiness (Kobasa, 1979), self-complexity (Linville, 1988), sense of coherence (Antonovsky, 1979, 1984), sense of humour (Martin & Dobbin, 1988; Nezu, Nezu, & Blissett, 1988), social support (Cohen & Wills, 1985), telic/paratelic dominance (Martin, Kuiper, Olinger, & Dobbin, 1987), and more recently, personal meaning (Reker & Butler, 1990), and pet ownership (Siegel, 1990).

Viewed one way, this research illustrates the complexity and diversity of individual difference stress moderators. Looked at differently however, it also exemplifies the chaos that can be viewed as characterizing moderator research. More succinctly and relevant to personality [moderator] research in



general, Kenrick and Dantchik (1983) concur by arguing that "catalogues of convenience have replaced meaningful taxonomies of personality traits among most of the current generation of social/personality researchers."

More to the point, it is argued here that moderator research has essentially focused on too many specific, less general constructs (e.g., humour appreciation, dispositional optimism), with the end result of failing to place them into a common nomological net. For example, while many resources such as hardiness, potency, and sense of coherence appear to be conceptually similar (Gosse, 1988), few, if any attempts have been made to determine their interrelationships within an a priori model. This pattern seems both alarming and unnecessary. What is needed is a broad, general model which in essence is capable of organizing the vast array of moderator variables into a macroscopic and interpretable framework. This will be further pursued in the next section.

2. Resource Redundancy? The need to establish order among moderators is made more evident when one takes into consideration the redundancy that is sometimes observed among resources (e.g., Gosse, 1988; Guarnera & Williams, 1987; Korotkov, 1991b; Scheier & Carver, 1985). For instance, when Gosse factor analyzed components of the hardiness, sense of coherence, and potency measures, all presumed moderators, principal components analysis yielded a two factor structure in which all variables, excluding the challenge component of the hardiness scale, loaded on one factor. Gosse suggests that this factor is best interpreted as self-efficacy. Further extraction and orthogonal rotation yielded the hardiness factor of challenge. Taken as a whole, these results and others seem to indicate that variations among moderator variables may be attributable to conceptual and/or operational similarity. That is, items in each of the questionnaires may have been tapping into an identical, underlying construct.

It seems apparent from this brief discussion that despite the utility of moderator research, the field appears to be in a state of disarray. To help resolve these issues, the present study proposes that one

category of stress moderators, namely personality resources, can be organized, interpreted, and integrated within a generalized framework. This framework will now be discussed.

#### A Possible Solution: The Superordinate Moderator Model

1. Cognitive Prototypes. The primary objective of the present study is to develop and test the concept of a "Superordinate" Stress Moderator. In theory, a superordinate moderator represents a single, global, unifying construct that is capable of accounting for the moderating effects of several more common, specific, lower-order resources.

In developing the superordinate model it first became necessary to define and describe the features that might generally typify such a construct. What became apparent to this writer at the onset is that the concept, superordinate, appears analogous to one theoretical domain within psychology, namely, cognitive prototype theory. Using this analogy, Wessells (1982) clearly elaborates on the prototype concept, "The average or most typical member of a category is called the prototype... Metaphorically, the prototype lies at the centre of the category whereas

atypical members lie near the periphery of the category." For instance, household furniture may be viewed as one distinct cognitive category. In terms of prototypicality, a couch may be viewed as being more typical of furniture than a kitchen chair.

To best understand the prototype concept, consider the inclusion hierarchy as depicted in figure 3. The first or top tier is the superordinate category level which is representatively broad, general, and distinct. Furniture is one example of a superordinate category. At the second or more basic level, the superordinate category is divided into lower-level exemplars (specific, distinct, but overlapping) which range from the most prototypical to the least prototypical. Using our furniture example, a couch may be more prototypical than a less typical kitchen chair. According to prototype theory, the number of prototypical exemplars is also assumed to be indeterminate with no definite boundary separating exemplars from each other. In this vein, prototypical exemplars are said to shade gradually into less prototypical exemplars (Russell, 1991). This notion of gradedness is referred to as "Internal Structure."

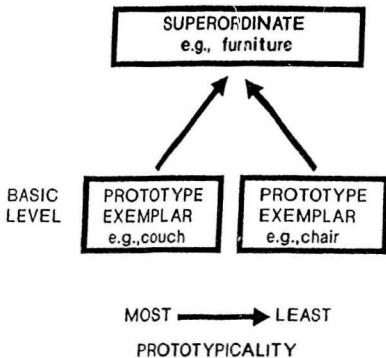


Figure 3. Prototype inclusion hierarchy.

Of particular importance to prototype theory is the idea of "Resemblance." Members at the basic level are said to "resemble each other in overlapping and criss-crossing ways that vary in kind and number" (Fehr & Russell, 1991; see also Russell, 1991; Wessells, 1982 for discussions on prototype theory). For instance, a couch may be viewed as being similar to a kitchen chair in a variety of ways such as having four legs and a wooden frame.

2. Stress Moderators and Prototypes. Borrowing loosely from prototype theory, I will now present a prototypical analogy for the superordinate stress moderator model. In general, a superordinate moderator would possess the following characteristics: (1) be conceptually broad/general and distinct as opposed to specific in scope; (2) the superordinate moderator would be conceptualized as being hierarchically arranged, subsuming more specific, lower order moderators at a basic-level; and (3) be empirically related to the prototypical moderators. At a more microscopic level, basic-level moderators would be described as possessing the following features: (1) be specific, distinct, concrete, yet overlapping in nature; (2) be subsumed both conceptually and

statistically to a superordinate moderator; and (3) have an indeterminate range of resource exemplars which gradually shade into one another.

As noted previously, categorical exemplars tend to resemble each other in "overlapping and criss-crossing ways." A similar pattern can be demonstrated with respect to moderator variables. That is, moderators can be shown to resemble each other both conceptually and empirically. As convincingly argued and demonstrated by Gosse (1988), many resources such as locus of control, hardiness, sense of coherence, and potency appear to be strongly interconnected to one another.

Closely tied in with the notion of resemblance is the idea of graded internal structure. Like cognitive prototypes, basic-level resources may be more or less prototypical of the superordinate moderator than other basic level resources. Empirically, this could be determined by evaluating the magnitude of relatedness of each basic level resource to that of the superordinate variable. If one basic level resource is more strongly associated with the superordinate variable than with another basic level resource, then the former may be said to be more prototypical than the latter. As shall be evidenced in later sections,

certain lower-level resources have been shown to vary in strength and magnitude with two potential superordinate moderators, that is, the personality types of extraversion-introversion and emotionality. Figure 4 presents a schematic diagram of the prototypical superordinate model in relation to stress and illness. The rationale for selecting these two variables will now be presented.

3. Extraversion-Introversion and Emotionality as Proposed Superordinate Stress Moderators. In selecting a potential superordinate stress moderator, we need to ask basically three questions. First, at what level shall we examine a set of resource variables; at the biological, at the intrapersonal, or the interpersonal? Secondly, does the variable match the superordinate model criteria? And lastly, why has this variable been selected over other possible resources?

With respect to the first question, the present research was designed to specifically evaluate the effects of personality on stress and health. This decision was made in consideration of the vast amount of research which has implicated personality as a vital factor in the stress/illness relationship. With reference to the second issue, the superordinate



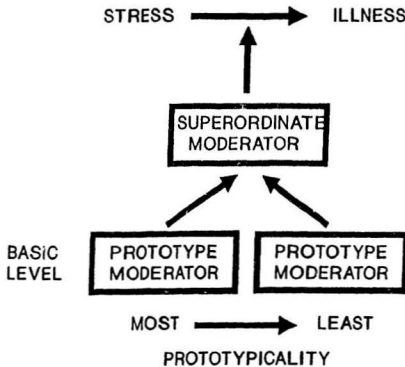


Figure 4. Prototype moderator model.

variable should not only be conceptually broad, general, and distinct, but also be related to a variety of basic level resources. Two personality variables were selected as potential superordinate resources, extraversion-introversion and emotionality. As can be seen from table 1, both personality types are broadly defined, comprised of a number of traits, yet remaining orthogonal. Furthermore, both variables have been shown to be related to a variety of stress buffers, as will be evidenced shortly.

The third and final question is, why not other dispositional variables as potential superordinate moderators? To answer this, one needs to look no further than the historical foundations of trait psychology. During the past five decades, personologists have attempted to systematize personality into orderly, taxonomic, or typological structures (Digman, 1989; Digman & Inouye, 1986; McCrae & Costa, 1987). Despite some agreement among theorists regarding super-order traits (i.e., central types), considerable disagreement exists as to the number of factors that define personality. For instance, while Eysenck (1976) argues on behalf of a three factor orthogonal typology, Cattell (1973) holds that

Table 1

Traits characterizing extraversion-introversion and  
emotionality

Personality Type	Traits Comprising Personality Type
<u>Extraverts</u>	changeable, impulsive, optimistic, active, sociable, outgoing, talkative, responsive.
<u>Introverts</u>	pessimistic, reserved, unsociable, quiet, passive, careful, thoughtful, peaceful.
<u>Emotionally Unstable</u>	sober, rigid, anxious, moody, touchy, restless, aggressive, excitable.
<u>Emotionally Stable</u>	controlled, reliable, even-tempered, calm, leadership like, carefree, lively, easy-going.

Note. Table information adapted from Rogers (1972).

Note. As the traits imply, extraverts are characterized as having a tendency of deriving satisfaction by directing their personal energies outward towards the physical and social environment. Conversely, introverts tend to be less social, and more pre-occupied with their own thoughts (Reber, 1985).

Note. Emotionality was previously, and to some extent still is, referred to as "Neuroticism." Because of a culturally defined stigma attached to this term, emotionality is now the preferred nomenclature. However, both terms refer to a global tendency to be emotionally reactive. In addition, note that emotionality should be distinguished from less transient mood states such as anxiety and depression. The concept of emotionality implies a consistency in behaviour.

personality can be adequately represented by a less restricted 16 factor nonorthogonal model. Intermediate between these two extremes is what many researchers (e.g., McCrae & Costa, 1987; Peabody, 1987; Peabody & Goldberg, 1989) have coined, "the Big Five Personality Factor Model." Despite some discrepancy regarding the number of factors that best describe the structure of personality, it appears that the majority of investigators have overwhelmingly agreed on the nature of at least two factors, extraversion-introversion, and emotionality (Brand & Egan, 1989; Eysenck, 1982; Morris, 1979).

Thus, in consideration of these issues, the decision to implement this specific two-type personality classification system was based on the following: (1) both factors are broad and general in scope; and (2) both variables have been found to be related to a variety of stress moderators. Other considerations include: (1) the dimensions of extraversion-introversion and emotionality have a firm historical foundation; (2) the two-factor model is economical; (3) the model has been researched both psychologically and physiologically; (4) broader personality typologies tend to be nonorthogonal (e.g.,

Cattell's 16-PF) while others have interpretational difficulties (e.g., Big Five Personality Typology); (5) broader models (e.g., Cattell) were designed more for clinical purposes and thus not suited for a normal population; and (6) the two-factor model is heuristically valuable.

4. Basic-level Resource Selection. Two criteria aided the selection of the basic-level moderators. First, the resource should be a personality trait as opposed to an interpersonal characteristic such as social support. This makes intuitive sense considering that we are attempting to match a second-order personality "type" with a first-order personality "trait." Secondly, the variables should have demonstrated some empirical or theoretical convergence with either extraversion-introversion or emotionality, or even variants of some related structure. Based on these considerations, the variables selected include sense of humour, psychological hardiness, dispositional optimism, and sense of coherence. These variables will now be discussed in terms of their relationship to both extraversion-introversion and emotionality. This will be followed up by a detailed presentation of the stress moderating properties of the superordinate moderators, extraversion-introversion, and emotionality.

(i) Sense of Humour. A general definition of the sense of humour construct is that humour "represents a rather complex higher-order cognitive-emotional process, whereas laughter is a reflex-like physiological-behavioral response" (Lefcourt & Martin, 1986, p.3). More specific definitions and taxonomies have been proposed by several authors (e.g., Hehl & Ruch, 1985; Levine & Rakusin, 1958; Moody, 1978) but for interpretational simplicity, Hehl and Ruch's moderately broad, four-fold categorical system will be implemented to organize the research relating sense of humour to extraversion-introversion and emotionality. Briefly, Hehl and Ruch hold that forms of humour can be categorized in terms of appreciation (i.e., liking of certain forms of humour), comprehension (i.e., getting the joke), expression (i.e., laughing and smiling in response to humour), and creation (i.e., initiating humour).

Several authors appear to agree that sense of humour is generally related to elements of (e.g., vigor, surgency, elation, social assertiveness, sensation seeking), in addition to, total extraversion-introversion (e.g., Bell, McGhee, & Duffey, 1986; Cetola & Reno, 1985; Hehl & Ruch, 1985; Lefcourt &

Martin, 1986; McGhee, 1986; Ruch, 1988; Ziv, 1982). For instance, in one study, Bell et al. (1986) found that humour creation was significantly correlated with both self-monitoring ( $r = .38, p < .001$ ) and social assertiveness ( $r = .36, p < .001$ ). In a different study which attempted to validate a measure of humour expression, Lefcourt & Martin (1986) discovered a moderate correlation between the Situational Humor Response Questionnaire and a measure of psychological vigor ( $r = .53, p < .001$ ). Thus, it appears that with some qualifications, which will be discussed shortly, humour is one characteristic that may be prototypical of an extraverted-introverted type.

In a different vein, some investigators have suggested that emotional symptomatology such as depression, anxiety, and neuroticism in general, does not appear to be related to sense of humour (Scogin & Merbaum, 1983; Vernis, 1970; Wilson & Patterson, 1969). Others however, maintain that humour appreciation and expression is beneficial in attenuating both depression (Cetola & Reno, 1985; Nezu, Nezu, & Blissett, 1988; Porterfield, 1987) and anxiety (Korotkov, 1990; Nemeth, 1979). Based on these studies, the consensus regarding if and how humour relates to emotionality is at best

mixed. A theoretical resolution of these discrepant findings remains elusive. Further research is certainly warranted.

Taken together, the following conclusions can be made with respect to the role of sense of humour in relation to both extraversion-introversion and emotionality: (1) humour appreciation, expression, and creation appear to be positively related to elements of extraversion-introversion. However, more research is needed to relate these aspects of humour to the broader extraversion-introversion dimension; (2) humour comprehension does not appear to be related to general measures of extraversion-introversion and emotionality but a lack of research regarding this type of humour is evident; and (3) with some reservations, humour appreciation and expression appear to be negatively associated with both depression and anxiety, regardless of research methodology (i.e., experimental vs. correlational).

(ii) Psychological Hardiness. One of the more popular moderators to be studied is psychological hardiness. Kobasa (1979) has defined hardiness as a constellation of traits comprised of challenge, commitment, and control that operate in sum to



attenuate the effects of stress on illness. Current research suggests that hardiness and its components may be related to both extraversion-introversion (Parkes & Rendell, 1988) and emotionality (Allred & Smith, 1989; Funk & Houston, 1987; Hull, Van Treuren, & Virnelli, 1987; Parkes & Rendell, 1988; Rhodewalt & Zone, 1989). In a recent study which utilized the "newest" revision of the hardiness scale, Parkes & Rendell (1988) found that total hardiness was related to both extraversion ( $r = .48, p < .01$ ) and neuroticism ( $r = -.44, p < .01$ ). More specifically, challenge was correlated with extraversion ( $r = .42, p < .01$ ) and neuroticism ( $r = -.45, p < .01$ ); commitment was associated with extraversion ( $r = .37, p < .01$ ) and neuroticism ( $r = -.37, p < .01$ ); and control was also correlated with extraversion ( $r = .43, p < .01$ ), but less with neuroticism ( $r = -.29, p < .01$ ).

More evidence in support of the hardiness-emotionality connection comes from Hull et al. (1987). In their critique, Hull et al. found significant, moderate correlations in the range of .21 to .45 among total hardiness, commitment, control, and measures of negative dysphoria (i.e., depression, self-esteem). Furthermore, in research which examined the cognitive

and physiological responses to evaluative threat among hardy and nonhardy individuals, Allred and Smith (1989) discovered that hardiness, as assessed by both a revised and short form measure, correlated with trait anxiety ( $r = .53$ ,  $p < .001$ ;  $r = .48$ ,  $p < .001$ , respectively). Moreover, in an experimental task designed to evaluate the hardy and nonhardy participant's physiological response consequent to a threatening task, Allred and Smith found that hardy respondents at baseline, demonstrated significantly lower arousal levels than those scoring lower in the trait, as one might expect. However, once emotionality, as assessed by trait anxiety, was statistically controlled for, this effect failed to reach significance. Viewed together, evidence from a variety of sources suggests that while hardiness appears to be related to extraversion-introversion, its association with both specific and broad measures of emotionality is more clearly defined.

(iii) Dispositional Optimism. As defined by Scheier and Carver (1985, 1987), dispositional optimism (operationalized by the Life Orientation Test) refers to generalized positive (i.e., optimists) or negative (i.e., pessimists) tendencies within individuals to

expect that good or bad things will happen to them. Regarding its relationship to the broader personality sphere (i.e., total personality space), research from a psychoanalytic perspective suggests that optimism may be related to extraversion-introversion (Howarth, 1980; Kline, 1981; Kline & Storey, 1977). For instance, Howarth found the Oral Optimism Questionnaire to be moderately correlated with two measures of extraversion-introversion, that is, dominance and sociability. More persuasive are the findings of Kline & Storey (1977). In their research, Kline and Storey attempted to validate and determine the correlates of the Oral Optimism Questionnaire and the Oral Pessimism Questionnaire by relating them to various facets and domains of the personality sphere. Preliminary analysis found small to moderate correlations between the Oral Optimism Questionnaire and various measures of extraversion-introversion (e.g., interest in social activities, adventurousness, gregariousness). Most importantly, when both the Oral Optimism Questionnaire and the Oral Pessimism Questionnaire were subject to a factor analysis with various personality inventories, it was revealed that while oral pessimism loaded most highly on pessimism and anxiety related factors (as

might be predicted), oral optimism loaded on an extraversion-introversion factor. These results appear to suggest that oral optimism is a higher-order component of extraversion-introversion and that pessimism is indicative of emotionality. Note however that the Oral Optimism Questionnaire reflects a depth psychology orientation as opposed to the Life Orientation Test which was operationally derived from a control-theory paradigm. Because of these theoretical differences, the instruments used to operationalize optimism are essentially distinct. For instance, in constructing the 20-indicator Oral Optimism Questionnaire, Kline & Storey (1977) operationalized this construct with only three items clearly related to an optimistic orientation. A glance at the Oral Optimism Scale also indicates a possible confound within the inventory. That is, the oral optimism and extraversion-introversion correlations may have been artificially inflated because several items contained within the Oral Optimism Questionnaire clearly mirror an extraverted-introverted type (e.g., liking for the novel, sociability). As such, the relationship between optimism and extraversion-introversion is at best, questionable.

To add more confusion, evidence from various sources using the Life Orientation Test (Carver & Gaines, 1987; Marshall & Lang, 1990; Scheier, Weintraub, & Carver, 1986; Smith, Pope, Rhodewalt, & Poulton, 1989; Staats, 1989) and other measures of optimism [excluding the Oral Optimism Questionnaire and the Oral Pessimism Questionnaire] (Dember & Brooks, 1989; Elo, 1985; Fibel & Hale, 1978; Prola, 1984) also suggests an optimism-emotionality relationship. In a recent report evaluating the psychometric properties of two hope constructs, Staats (1989) found the Life Orientation Test to be moderately correlated with an inventory of hopelessness ( $r = -.58$ ,  $p < .001$ ), and a measure of expected negative affect ( $r = -.37$ ,  $p < .001$ ). More suggestive evidence comes from two studies as reported by Smith, Pope, Rhodewalt, and Poulton (1989). In their research, preliminary analyses for three samples of college students used in both studies revealed correlations in the range of  $-.61$  to  $-.70$  ( $p < .001$ ) for trait anxiety and from  $-.50$  to  $-.63$  for manifest anxiety, in relation to dispositional optimism (i.e., Life Orientation Test). Similarly, the Generalized Expectancy for Success Scale (i.e., a measure of similar kind to the Life Orientation Test)

was also found to be correlated with trait anxiety ( $r$ 's =  $-.45$  to  $-.59$ ,  $p < .001$ ) and manifest anxiety ( $r$ 's =  $-.37$  to  $-.50$ ,  $p < .001$ ). More intriguing are the results of the subsequent partial correlations between optimism (i.e., both the Life Orientation Test and the Generalized Expectancy for Success Scale) and symptom reports [or coping behaviors]. Essentially, when anxiety levels were statistically controlled for, Smith et al. found that the majority of the significant correlations were eliminated. Taken together, the results from these studies strongly suggest that present measures of optimism are related in varying degrees with at least two measures of emotionality, depression, and anxiety. Whether optimism is related to general emotionality remains to be seen.

(iv) Sense of Coherence. Sense of Coherence was initially theorized, conceptualized, and operationalized by Antonovsky (1979, 1983, 1984, 1985, 1987). In his research, Antonovsky defined sense of coherence as a dispositional tendency to appraise life situations as both predictable and manageable. In operationalizing the sense of coherence construct, Antonovsky adopts a salutogenic (i.e., prevention model) as opposed to a pathogenic approach (i.e.,

disease model). According to Antonovsky, the sense of coherence disposition is comprised of three components; comprehensibility, manageability, and meaningfulness.

Reports from two studies suggest that sense of coherence is linked to extraversion-introversion (Margalit, 1985; Margalit & Eysenck, 1990). In one study, Margalit compared life satisfaction, perceptions of parental roles, and sense of coherence between hyper- and nonhyperactive children (10-12 years of age). Relevant to the present study, Margalit found that hyperactive (assumed here to be somewhat conceptually akin to a component of extraversion-introversion, that is, activity) as compared to nonhyperactive children showed significantly lower total sense of coherence scores in addition to similar differences on its subscales (i.e., comprehensibility, manageability, meaningfulness). Thus it seems that a linear relationship exists between degree of hyperactivity and sense of coherence.

More suggestive evidence of a sense of coherence/extraversion-introversion relationship comes from a study by Margalit and Eysenck who examined the relationship between gender, personality structure

(i.e., extraversion-introversion, neuroticism, psychoticism, lying), family climate, and social competence to sense of coherence among a sample of 742 adolescents (i.e., 12-16 years of age). Using the Junior Eysenck Questionnaire to assess personality structure, Margalit and Eysenck found that extraversion-introversion ( $B = 1.39$ ,  $p < .01$ ;  $r = .23$ ), in addition to neuroticism ( $B = 1.82$ ,  $p < .01$ ;  $r = -.36$ ) and psychoticism significantly predicted sense of coherence.

Results from a variety of studies indicate that the composite measure of the Sense of Coherence Scale is also related to emotionality (i.e., Antonovsky, 1987; Antonovsky & Sagy, 1985; Bernstein & Carmel, 1987; Carmel & Bernstein, 1989). For example, Antonovsky and Sagy examined the relationship between sense of coherence and trait-state anxiety in two groups of adolescents from differing communities in Israel. Results suggested that while small to moderate correlations were found for both groups with respect to sense of coherence and state anxiety, stronger relationships were observed regarding trait anxiety (ave.  $r = -.59$ ,  $p < .001$ ). In a different study, Bernstein and Carmel (1987) found sense of



coherence to be strongly and significantly correlated with trait anxiety ( $r = -.77$ ,  $p < .001$ ). Similar evidence was also found by the same authors (i.e., Carmel & Bernstein, 1989) using a longitudinal design. Correlations in the range of  $-.70$  to  $-.77$  were observed between sense of coherence and trait anxiety in the longitudinal analyses. In response to these findings, Carmel and Bernstein argue that sense of coherence and trait anxiety are actually measuring the same underlying phenomena, in this sense, negative affectivity or emotionality.

Two conclusions seem appropriate here: (1) sense of coherence appears to be related to extraversion-introversion; and (2) sense of coherence is clearly related with both specific trait anxiety and general emotionality (i.e., neuroticism).

5. Summary. This literature review has suggested the following relationships: (1) sense of humour appears to be associated with specific measures of both extraversion-introversion and emotionality; (2) psychological hardiness has been found to be related to both extraversion-introversion and emotionality; (3) dispositional optimism has been found to be related to

specific measures of emotionality; however, despite suggestive evidence, the relationship between dispositional optimism and extraversion-introversion is less certain; and (4) sense of coherence appears to be strongly associated with trait anxiety and to a lesser degree with general emotionality. Its relationship with extraversion-introversion is less established, although suggestive.

This literature review has examined how several specific, basic-level resources relate to each of the proposed superordinate moderators, extraversion-introversion and emotionality. What follows next is a consideration of the way in which one of the superordinate variables, extraversion-introversion, might function as a moderator within the stress/illness framework. The relationship between emotionality and health will be subsequently pursued.

#### Extraversion-Introversion as a Superordinate Moderator

To understand how extraversion-introversion might affect the stress/illness relationship, Eysenck's (1967, 1985) model of personality and arousal will serve as the guiding theoretical framework (see Figure 5). To this end, note that I will be extrapolating from

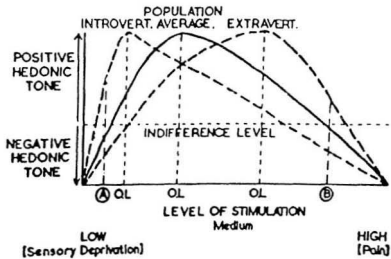


Figure 5. Eysenck's model of personality and arousal  
(Adapted from Eysenck, 1967).

Eysencks' assertions regarding his concepts of arousal/stimulation and hedonic tone (i.e., like-dislike) to stress and physical symptoms, respectively. Put differently, I am suggesting that a parallel can be drawn between: (1) arousal/stimulation and stress; and (2) hedonic tone and symptomatology. Thus, references to Eysencks' hypotheses will imply analogous expectations in the present research paradigm.

In his model, Eysenck argues that there are personality differences (i.e., extraversion-introversion) in the way that individuals experience stress or arousal. These differences can be traced to the following postulates as suggested from Figure 5: (1) for introverts, low levels of stimulation (i.e., stress) are related to positive hedonic tone (i.e., low symptomatology); (2) for introverts, moderate or high levels of stimulation are linearly associated with negative hedonic tone (i.e., symptomatology); (3) for extraverts, low levels of stimulation below their optimal level are associated with negative hedonic tone (i.e., symptomatology); (4) for extraverts, moderate or optimal levels of stimulation are related to positive hedonic tone (i.e., low symptomatology); and (5) for

extraverts, negative hedonic tone (i.e., symptomatology) is associated with levels of stimulation beyond optimal.

In sum, while Eysenck argues that there is a closer approximation to a linear relationship between stimulation and hedonic tone for introverts, there is a curvilinear association for extraverts. To explain these differences, Eysenck (1982) argues that because extraverts have lower levels of cortical arousal, and hence, higher sensory thresholds, optimal levels of stimulation are significantly greater for them. Differently, introverts are characterized as having high levels of cortical arousal and low sensory thresholds. Thus, only low levels of optimal stimulation are tolerable.

While some researchers have failed to find evidence for various aspects of the model (e.g., Schneller & Garske, 1976; Smith, Rypmat, & Wilson, 1981), Eysenck's theory has generally been supported (e.g., Donne & Ekehammar, 1990; Frigom, 1976; Hill, 1975; Ludvigh & Happ, 1974; Mathew, Weinman, & Bar, 1984). However, the nonlinear components of the model have yet to be tested with respect to stress and illness. Evidence for a possible stress moderating role of extraversion can be grouped according to four

sources: (1) additive models; (2) conceptually related variable models; (3) multiplicative physiological outcome models; and (4) multiplicative illness outcome models.

1. Additive Models. One source of evidence has suggested that extraversion-introversion is directly linked to a variety of psychosocial criteria, including positive, negative, and total affect (Camp, 1980; Costa & McCrae, 1980; Lawton, 1983; McCrae, 1983; Windle, 1989), composite health (Garritty, Somes, & Marx, 1977), recovery from anxiety neurosis (Skevington, 1977) hospitalization (Cohler, Grunebaum, Weiss, Galbant, & Abernathy, 1974), total symptomatology, virus shedding (Totman, Kiff, Reed, & Craig, 1980), desire to drink (Forsyth & Hundleby, 1987), and anxiety, maladjustment, and depression (Naditch & Morrissey, 1976). The most popular of these additive models is the one researched by Costa & McCrae (1980). In describing their model of happiness, Costa & McCrae argue that subjective well-being is influenced by both positive and negative affect which are separately and respectively influenced by two orthogonally distinct personality types, extraversion-introversion and neuroticism (i.e., emotionality). Using data collected from a national

aging study of men (age ranging from 35 to 85) over a ten-year period, Costa and McCrae found that: (1) extraversion-introversion was more predictive of positive affect than neuroticism; (2) neuroticism was more predictive of negative affect than extraversion-introversion; and (3) both extraversion-introversion and neuroticism were both predictive of total well-being. According to Costa and McCrae, these findings lend support to their model of personality and happiness.

In sum, these studies support the additive model of personality and well-being. Note that of all these studies, only three (i.e., Forsyth & Hundleby, 1987; Naditch & Morrissey, 1987; Totman, Kiff, Reed, & Craig, 1980) included a stress by person variable interaction term. While these interactions failed to reach statistical significance, a quadratic component was not included in any of these cases. Thus, is it possible that a curvilinear model of stress, personality, and well-being might better fit the data?

2. Conceptually Related Variable Models. A second area of research comes from investigations that have employed variables conceptually related to extraversion-introversion, such as sensation seeking

(Smith, Johnson, & Sarason, 1978), and telic/paratelic dominance (Martin, 1985; Martin, Kuiper, Olinger, & Dobbin, 1987). In one study Martin (1985) attempted to determine if the trait of telic/paratelic dominance, a characteristic derived from reversal theory, would moderate the relationship of both college and daily stress on mood disturbance. In terms of stress buffering Martin argued that paratelic dominant individuals would be buffered under moderate but not high stress levels. Differently, telic dominant types would experience a linear increase in stress proportional to the chosen outcome variable. According to reversal theory telic individuals are characterized as being serious, arousal avoidant, and goal directed. In addition, any arousal that is experienced is usually viewed by them as both unpleasant and anxiety related. Conversely, those in the paratelic mode are characterized as playful, arousal seeking, and spontaneous. From this perspective, the same arousal would be seen as unpleasant.

The results indicated clear support for Martin's hypotheses. Most emphatically, these findings are also in line with Eysenck's theory (see Figure 5) as described previously. Martin et al.(1987) concur by pointing out that the measure of telic/paratelic



dominance overlaps with scales from different theoretical viewpoints including that of Eysenck.

### 3. Multiplicative Physiological Outcome Models.

Recent investigations have also suggested that extraversion-introversion moderates the effects of differing forms of stress/arousal (e.g., difficult tasks, caffeine-induced arousal) on various physiological measures such as auditory sensitivity (Dornic & Ekehammar, 1990; Geen, McCown, & Broyles, 1985; Stelmack & Campbell, 1974), pulse rate (Geen, 1984), and skin conductance levels (Fowles, Roberts, & Nagel, 1977). In one study for instance, Geen (1984) examined preferred levels of stimulation (i.e., noise intensity) for both extraverts and introverts. Pulse rate and number of trials to criterion on a paired-associate task served as the dependent variables. With pulse rate as the criterion Geen found that as noise intensity increased to a moderate level, pulse rates for extraverts were significantly lower than for introverts. Similar findings consonant with Eysenck's model were also found in the criterion trials task. While Geen failed to test for any quadratic trends, the distribution of means for both pulse rate

and trials to criterion suggested a close parallel with Eysenck's curvilinear model of personality (See Figure 5).

4. Multiplicative Illness Outcome Models. The last source of evidence comes from studies which have examined the relationship of extraversion-introversion to stress and illness. In general research here has been mixed. Of these investigations, two studies found suggestive evidence that extraversion-introversion moderates the effect of stress (i.e., life change) on both physical disorders (Miller & Cooley, 1981) and psychological strain (Duckitt & Broll, 1982). However, extraversion-introversion failed to buffer stress (i.e., life change, interviews, differing situations) in relation to virus shedding (Totman, Kiff, Reed, & Craig, 1980), anxiety, maladjustment, depression (Naditch & Morrissey, 1976), illness behaviour (Duckitt & Broll, 1983), and desire to drink (Forsyth & Hundleby, 1987). Note that in all these studies a curvilinear stress by moderator trend was not evaluated. Once again, is it possible that a nonlinear model, such as the one proposed by Eysenck, best fits the data? The results from this review appear to suggest this possibility.

Overall this review seems to indicate that: (1) extraversion-introversion is directly related to a variety of psychological and physical outcome measures; (2) extraversion-introversion moderates the effects of various forms of stress/arousal on differing physiological response indices and these effects may have quadratic origins; (3) variables conceptually related to extraversion-introversion appear to converge in line with Eysenck's theoretical predictions; and (4) research relating extraversion-introversion to stress/arousal and psychological and physical health has had mixed results. This may be due, however, to the failure to test for any curvilinear trend.

#### Emotionality as a Superordinate Moderator

It is predicted that emotionality, in the same way as extraversion-introversion, will operate as a unique superordinate moderator. Research which has elaborated upon both additive and multiplicative models suggests that emotionality may be an important moderator of the stress/illness relationship.

1. Additive Models. In brief, a great deal of research has suggested that emotionality is a significant predictor of symptomatology (Costa & McCrae, 1987; Innes & Kitto, 1989; Levenson, Aldwin, Bosse, & Spiro III, 1988; Okun & George, 1984; Ormel, 1983), health problems (Garritty, Somes, & Marx, 1977), and negative, positive, and total affect [balance] (Costa & McCrae, 1980; Emmons & Diener, 1985; Okun & George, 1984; Ormel, 1983).

These findings suggest two conclusions. First, research has consistently linked emotionality with negative affect. Costa and McCrae's (1980) model of happiness is of relevance here. Secondly and more closely related to health, emotionality appears to be moderately related to illness complaint measures, although apparently more so with respect to psychological as opposed to physical symptomatology.

2. Multiplicative Moderator Model. Within this model one's reaction to stress is a function of one's tendency to be emotionally reactive. With the exception of a few studies (Denney & Frisch, 1981; Duckitt & Broll, 1983), it appears that emotionality may be important in influencing the stress/illness process. For instance, in a ten-year longitudinal study Aldwin

et al. found that emotionality, as measured by Eysenck's neuroticism scale, moderated the effects of both life events and daily hassles on illness reports for a sample of elderly men. The findings indicated that emotionally reactive individuals, when confronted with high levels of both daily and major life stress, experienced a greater degree of illness. While supporting the moderator hypothesis, these results are questionable for a variety of reasons. First, the interaction between emotionality and both stress measures accounted for only a meagre .5 to 1% of the total variance. This becomes an issue when one considers that the variance of prior illness scores from time one were not partialled out from symptoms at time two. It is possible, therefore, that previous illness could have influenced both stress and illness scores at time two. In addition, Aldwin et al. (1989) may have obtained moderating effects because of a biased sample. Of the 2,280 men who completed wave one only 1,159 completed both waves. Furthermore, those who completed both waves were found to be less emotional and more healthy, as compared to those who completed only the first wave. One possibility, therefore, that may account for the

results is that the stress reduction outcome may have been illusory, occurring primarily as a result of a biased sample giving rise to a subsequent restriction in range. Given these concerns the conclusions reached by Aldwin et al. are at best dubious.

In a different study, Parkes (1986) examined the effects of personality, environmental, and situational characteristics on the coping behaviour of 135 first year student nurses. The results indicated that neuroticism moderated the quadratic relationship between work demand and two forms of coping behaviour. However, because of the study's retrospective nature, assertions of causality are not possible. Prospective research methodology needs to verify these findings. Nonetheless, these findings suggest that emotionality may moderate a curvilinear stress/illness relationship, although this possibility has yet to be tested.

One final source of evidence comes from research examining Endler's (1988a) multidimensional interaction model of anxiety. In his model, Endler postulates that increases in state anxiety will occur when a specific facet of trait anxiety (e.g., social evaluation trait anxiety) interacts with a congruent stressful situation

(e.g., social evaluation situation). Specifically, when a highly trait anxious individual is confronted with a congruent stressful situation, the same person experiences an increase in state anxiety. Endler terms this series of events, "the Differential Hypothesis." Research appears overwhelmingly to support this reactive state-trait model of anxiety (Endler, 1988a; Endler, 1988b; Endler & Okada, 1975; Flood & Endler, 1980; Kendall, 1978; King & Endler, 1990; Phillips & Endler, 1982; Rappaport & Katkin, 1972; Spielberger, Auerbach, Wadsworth, Dunn, & Taubee, 1973).

The following conclusions can be made with respect to emotionality: (1) emotionality appears to be predictive of both affect and symptomatology; (2) the linear/curvilinear relationship between stress and illness [and coping behaviour] may vary as a function of emotionality, although this hypothesis has yet to be adequately and fully explored; and (3) specific facets of emotionality (i.e., trait anxiety) appears to moderate the effects of congruent situational stress.

### Hypotheses for Superordinate Models

Based on this literature review the following hypotheses are posited:

1. Extraversion-Introversion. (i) Under low stress, extraverts will experience higher levels of physical symptoms (i.e., symptomatology) than introverts; (ii) under moderate levels of stress, extraverts will experience less symptomatology than introverts; (iii) under high levels of stress, extraverts will experience a linear rise in symptoms, similar to introverts; and (iv) under moderate and high levels of stress, there will be a proportional increase in physical symptoms for introverts.

2. Emotionality. (i) Under high stress, highly emotional individuals will experience higher symptom scores than those less emotional. It is also possible that there are quadratic stress by emotionality effects. This possibility will be explored.



## Method

### Participants

Exactly 714 students from Memorial University of Newfoundland, St. John's, Canada (234 men, 478 women, 2 missing data points;  $M$  age = 21.02,  $SD$  = 3.27) participated in the first wave of a two-wave prospective study. Four weeks later, 510 participants from wave one took part once again. This represents an overall return response rate of 71%. All data were collected in large classrooms from courses in personality, human sexuality, developmental psychology, and social cognition.

### Measures

The following questionnaires were administered to all participants:

1. Bipolar Trait Adjective Checklist (McCrae & Costa, 1985; see Appendix A). To assess both extraversion-introversion and emotionality, 16 bipolar adjectives, taken from Costa and McCrae were chosen. Approximately eight items were selected for each construct. Item selection was based on the eight largest factor loadings for each variable. Each bipolar adjective was scored on a 9-point scale. For each

construct four bipolar adjectives were scored positively while four were scored negatively. All 16 adjectives were then randomized.

2. Coping Humour Scale (Martin & Lefcourt, 1983; see Appendix B). The 7-item Coping Humour Scale assesses the extent to which an individual uses humour to combat stress. An exemplar item is, "I often lose my sense of humour when I'm having problems." Respondents are requested to answer each statement on a 4-point scale ranging from 1 = "Strongly disagree" to 4 = "Strongly agree." Two items are reversed prior to scoring. All items are then summed to give a total score.

3. The Short-Form Sense of Coherence Scale (Antonovsky, 1986; see Appendix C). The 13-item sense of coherence measure was used to assess the three subconstructs of meaningfulness, manageability, and comprehensibility. The scale consists of 4 meaningfulness items, 5 comprehensibility items, and 4 manageability items. Participants are requested to respond to each statement on a 7-point scale which ranges from 1 = "Very often" to 7 = "Very seldom or never." Five items are reversed prior to summing the whole scale to yield a total score.

#### 4. The Short-Form Personality Hardiness Measure

(Kobasa, Maddi, & Puccetti, 1982; see Appendix D).

This scale consists of 20 items used to measure each of the three hardiness components, challenge, commitment, and control. The scale contains approximately 5 challenge items, 6 commitment items, and 9 control items. Fourteen items make use of a Likert scale format which ranges from 0 = "Not at all true" to 3 = "Completely true." The remaining six items require subjects to indicate which of two statements best reflects their attitude. All three subscales are then transformed into z-scores. To obtain a positive hardiness total score, all three components were then multiplied by -1 and then summed.

5. Life Orientation Test (Scheier & Carver, 1985; see Appendix E). This 12-item scale consists of 8 items that are used to measure dispositional optimism. The remaining four items are used as fillers. To reduce the number of questions that subjects are requested to answer, all four filler items were removed. The eight optimism questions were then randomized. Participants are requested to respond to each question on a five-point scale ranging from 1 = "Strongly disagree" to 5 = "Strongly agree." A typical item on this scale is "In uncertain times, I usually expect the best."

6. Daily Stress (see Appendix F). A 10-item hassles scale was recently developed based on data obtained from a study by Krachun (1990). To assess daily stress, Krachun made use of the recently revised Hassles and Uplifts Scale (DeLongis, Folkman, & Lazarus, 1988). To construct a psychometrically pure and shortened version of the scale, it was first necessary to remove all hassle-symptom item confounds (e.g., "your health") and all multi-barrelled indicators (i.e., items with more than one meaning; see Korotkov, Krachun, & Hannah, 1991 for a detailed discussion regarding these issues). All 28 of the remaining items were then subjected to an internal reliability analysis. This process was then repeated for the second wave of Krachun's prospective study. The inter-item correlations for the 28-item scales were then averaged over the two waves. The top ten items which showed the highest corrected inter-item correlations with the 28-item scale were chosen. Cronbach's alpha for both wave one ( $\alpha = .79$ ) and wave two ( $\alpha = .84$ ) of the ten-item scale (as derived from Krachun, 1990) appeared adequate and test-retest reliability yielded a relatively stable correlation coefficient ( $r = .74$ ). The

survey was administered under the heading "The M.U.N. Hassles Scale." All subjects responded to each item on a four-point scale ranging from 0 = "None, not applicable" to 3 = "A great deal." This 10-item scale was strongly correlated with the 53-item scale for time 1,  $r = .80$ ,  $p < .0001$  and for time 2,  $r = .86$ ,  $p < .0001$ .

7. Perceived Physical Symptomatology (see Appendix G). A shortened version of Cohen and Hoberman's (1983) 33-item perceived physical symptom scale was constructed. Using data available from Krachun (1990), a 10-item symptom scale was developed. In developing the symptom scale, all apparent multi-barrelled items were removed leaving 23 items. This was repeated for both waves. The remaining items from both time periods were then each subjected to an internal reliability analysis. All corrected inter-item correlations from both waves were then averaged together. The top-ten items with the largest inter-item correlations were then selected. Alpha at time one was found to be .80, while alpha at time two was .84. Test-retest reliability of the 10-item scale yielded a moderately stable coefficient,  $r = .59$ ,  $p < .0001$ . The ten-item scale was also strongly correlated with the

full 33-item scale for time 1 ( $r = .92$ ,  $p < .0001$ ) and for time 2,  $r = .91$ ,  $p < .0001$ . Respondents are requested to answer each question on a 5-point scale ranging from 0 = "Not all" to 4 = "Extremely."

8. The Situational Humour Response Questionnaire Abridged Version (see Appendix H). A shortened version of the 21-item Situational Humour Response Questionnaire (Martin & Lefcourt, 1984) was included for exploratory purposes (see Korotkov, 1991a for a discussion on the development of this abridged scale). This abridged scale consisted of 11-items. The Situational Humour Response Questionnaire operationalizes sense of humour as the extent to which an individual smiles or laughs in a wide variety of positive and negative situations. A total score is obtained by summing all questions on a five-point index ranging from 1 = "I wouldn't have found it particularly amusing" to 5 = "I would have laughed heartily." Because this measure was not intended for use in the present study, no statistical analyses will be presented in the subsequent results chapter.

9. Demographics. Data regarding the subjects' age, sex, and class were also obtained.

### Procedure and Design

Wave One. Arrangements were made with three professors to attend four classes (one professor was in charge of two classes) twice over a four week interval to administer the first series of questionnaires. This initial period of testing took place between the final week of January 1991 and the first week of February 1991. Approximately fifteen to twenty minutes were required to complete the questionnaires. For wave one, the surveys were administered in the following two orders: (1) physical symptoms, hardiness, daily stress, optimism, extraversion-introversion/emotionality, sense of humour, and sense of coherence; and (2) optimism, extraversion-introversion/emotionality, sense of humour, daily stress, hardiness, sense of coherence, and physical symptoms. Prior to class administration, students were informed that the session was the first of a two-phase study, and that it was necessary for them to create a six-digit code for matching purposes (see Appendices I, J). Subjects were also informed that participation was completely voluntary. In addition, it was requested that subjects work alone and answer all questions.

Wave Two. Approximately four to five weeks later, the same participants were readministered the identical stress and symptom measures. In addition, the Situational Humour Response Questionnaire-Revised Form was also distributed. The three different orders of questionnaires were as follows: (1) The Situational Humour Response Questionnaire, daily stress, and physical symptoms; (2) physical symptoms, the Situational Humour Response Questionnaire, and daily stress; and (3) daily stress, physical symptoms, and the Situational Humour Response Questionnaire. While the surveys were being distributed, participants were requested to generate the same code they constructed for wave one. Participation was once again stressed as voluntary. In addition, subjects were asked to work alone and to answer all questions. Approximately 5-10 minutes were required to complete the wave two surveys. During the last week of March 1991 and the first week of April 1991, all classrooms were debriefed as to the nature of the research.



## Results

### Overview

The use of a hierarchical moderated multiple regression procedure failed to lend support for the proposed superordinate stress moderators, extraversion-introversion and emotionality. In both prospective analyses, no significant moderating effects were observed for any of the superordinate or prototypical resource interactions. Encouragingly, when extraversion-introversion was utilized as the superordinate resource, sex of participant, symptoms time 1, stress time 2, and sense of humour, were all significant in predicting symptoms at time 2. When emotionality served as the superordinate resource, sex of participant, symptoms time 1, stress time 2, and emotionality were all significant in predicting the criterion. Subsequent model comparisons (quadratic interaction vs. linear interaction vs. main effect) suggested that in both superordinate analyses, the pure main effects model best fit the data.

### Psychometric Analyses

1. Factor Structure. To determine if the identical personality factor structure for both emotionality and extraversion-introversion could be replicated from McCrae and Costa (1985), the 16 bipolar-semantic adjectives were subject to a principal components analysis with varimax rotation. Initial extraction and subsequent orthogonal rotation yielded three factors, two of which were clearly identifiable as extraversion-introversion, and emotionality. The third factor, comprised of three items, was strongly correlated with the emotionality factor ( $r = .76$ ; see Table 2). It was therefore decided to run a second factor analysis, rotating only the first two factors. The output from this analysis yielded the expected two factor solution, explaining a total of 44.2% of the variance (see Table 3). Note that interestingly, the secure-insecure item loaded on both factors while the emotional-unemotional item loaded on only the extraversion-introversion factor. Thus, with some exceptions, these results basically replicate the findings of McCrae and Costa.

2. Internal Consistency and Description. In a recent computer simulation, Dunlap and Kemery (1988) have shown that the more reliable one's measures are,

Table 2

Principal components analysis for the 16-bipolar  
adjectives with 3 factor solution

Adjectives	Factors			h <sup>2</sup>
	1	2	3	
1. Sociable-Retiring (E)	.76			.30
2. Friendly-Aloof (E)	.73			.57
3. Joiner-Loner (E)	.69			.61
4. Affectionate-Reserved (E)	.65			.52
5. Emotional-Unemotional (N)	.63			.49
6. Fun Loving-Sober (E)	.64			.40
7. Talkative-Quiet (E)	.57			.61
8. Active-Passive (E)	.53			.38
9. Worrying-Calm (N)		.79		.69
10. Nervous-At ease (N)		.71		.54
11. Insecure-Secure (N)		.67		.52
12. Self-pitying- Self-satisfied (N)		.64		.46
13. High-strung-Relaxed (N)		.54	.49	.55
14. Spontaneous-Inhibited (E)	.44	-.47		.45
15. Impatient-Patient (N)			.78	.64
16. Temperamental- Even-tempered (N)			.77	.61
Eigenvalues	4.54	2.52	1.57	
Percent Variance	28.40	15.80	9.80	

Note. E = Extraversion-introversion; N = Neuroticism (i.e., Emotionality).

Note. Blanks indicate that coefficients lower than .4 were suppressed in the analysis. Thus, not all factor loadings are shown.

Note. Bartlett's Test of Sphericity = 3581.01,  $p = .00000$ ; Kaiser-Meyer-Olkin Measure of Sampling Adequacy = .85.

Table 3

Principal components analysis for the 16-bipolar  
adjectives with 2 factor solution

Adjectives	Factors		h <sup>2</sup>
	1	2	
1. Joiner-Loner (E)	.77		.59
2. Sociable-Retiring (E)	.76		.58
3. Talkative-Quiet (E)	.70		.49
4. Friendly-Aloof (E)	.70		.50
5. Fun Loving-Sober (E)	.60		.37
6. Active-Passive (E)	.60		.37
7. Spontaneous-Inhibited (E)	.57		.38
8. Affectionate-Reserved (E)	.54		.29
9. Emotional-Unemotional (N)	.54		.40
10. Worrying-Calm (N)		.79	.64
11. High-strung-Relaxed (N)		.73	.54
12. Nervous-At ease (N)		.66	.49
13. Self-pitying- Self-satisfied (N)		.56	.43
14. Temperamental- Even-tempered (N)		.53	.29
15. Impatient-Patient (N)		.51	.26
16. Insecure-Secure (N)	-.49	.49	.43
Eigenvalues	4.55	2.52	
Percent Variance	28.40	15.80	

Note. Blanks indicate that coefficients lower than .4 were suppressed in the analysis. Thus, not all factor loadings are shown.

Note. E = Extraversion-introversion; N = Neuroticism (i.e., Emotionality).

Note. Bartlett's Test of Sphericity = 3581.01,  $p = .00000$ , Kaiser-Meyer-Olkin Measure of Sampling Adequacy = .85.

the greater the probability of detecting moderation effects. In consideration of this, all variables were subjected to an internal reliability analysis. Where appropriate, items were deleted in order to improve the strength and consistency of the measures, without loss to face validity.

For the 10-item extraversion-introversion factor, Cronbach's alpha was found to be .74. Removal of the secure-insecure bipolar adjective (corrected inter-item correlation =  $-.38$ ) increased alpha to .83. For the 7-item emotionality factor, alpha was found to be .75. No further changes were made to these two factors.

Scale alterations were also necessitated for the hardiness measure and the Coping Humour Scale. For the Hardiness scale, deletion of item number 10 (i.e., "There are no conditions which justify endangering the health, food, and shelter of one's family or one's health"; corrected inter-item correlation =  $.09$ ) increased alpha from .68 to .70. For the Coping Humour Scale, removal of item number four (i.e., "I must admit my life would probably be easier if I had more of a sense of humour"; corrected inter-item correlation =  $.24$ ) increased alpha from .71 to .73. All remaining measures including the Sense of Coherence Scale (alpha = .83), the Life Orientation Test (alpha = .80),

hassles wave 1 ( $\alpha = .77$ ), hassles wave 2 ( $\alpha = .77$ ), symptoms wave 1 ( $\alpha = .83$ ), and symptoms wave 2 ( $\alpha = .84$ ) exhibited adequate levels of internal consistency.

Once all alphas were computed and corrected for, all variables were then subjected to descriptive and correlational analyses. Tables 4, 5, and 6 present the zero-order correlations along with their respective means and standard deviations for all variables.

### 3. Assumption Analyses: Transformed vs. Raw Data.

It has been suggested that violations of certain statistical assumptions (i.e., normality, linearity, homoscedasticity) may detrimentally affect the significance level of a moderated regression interaction term (Stone & Hollenbeck, 1989). To determine the presence of such violations, the data were subject to a statistical assumption analysis. Subsequent tests for skewedness revealed significant and severe departures from normality for symptoms wave 1 ( $z = 13.61$ ,  $p < .001$ ), symptoms wave 2 ( $z = 8.61$ ,  $p < .001$ ), the Coping Humour Scale ( $z = 3.89$ ,  $p < .01$ ), personality hardiness ( $z = 6.02$ ,  $p < .001$ ), extraversion-introversion ( $z = 4.34$ ,  $p < .01$ ), sex of participant ( $z = 7.95$ ,  $p < .001$ ), and age of participant

Table 4

Correlations among sex, age, questionnaire order, stress, symptoms (i.e., Symp.), and personality

Variables	Stress	Stress	Symp.	Symp.
	1	2	1	2
1. Sex	-.09	-.08	-.25	-.24
2. Age	.03	.07	-.11	-.03
3. Order	.04	-.03	.06	.02
4. Extraversion	-.02	.04	.00	-.00
5. Emotionality	.27	.27	.35	.37
6. Humour	-.13	-.12	-.12	-.21
7. Optimism	-.23	-.18	-.28	-.25
8. Hardiness	-.33	-.27	-.32	-.24
9. Coherence	-.36	-.26	-.39	-.30

Note.  $p < .10$  for correlations =  $-.08$ ;  $p < .05$  for correlations =  $-.09$  to  $-.13$ ; and  $p < .001$  for correlations =  $-.18$  to  $-.39$ .

Note. All correlations based on two-tailed tests.

Note. For Stress 1 and Symptoms 1,  $N = 650$ ; For Stress 2 and Symptoms 2,  $N = 450$ .

Table 5

Correlations among sex, age, questionnaire order,  
and personality characteristics

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Vars.	1	2	3	4	5	6	7	8	9
<hr/>									
1. Sex	*	-.01	.03	-.11	-.18	.12	.13	-.08	.11
2. Age		*	-.03	-.09	-.06	.03	.06	.03	.12
3. Order			*	.02	-.06	.08	.06	-.05	.01
4. Extraversion				*	-.27	.34	.32	.12	.24
5. Emotionality					*	-.44	-.49	-.26	-.57
6. Humour						*	.40	.17	.34
7. Optimism							*	.34	.53
8. Hardiness								*	.51
9. Coherence									*

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Note.  $p < .10$  for correlations = .079;  $p < .05$  for correlations = -.08 to -.09;  $p < .01$  for correlations = .11 to .12; and  $p < .001$  to -.57.

Note. All significance levels are based on two-tail tests.

Note.  $N = 650$ .



Table 6

Means and standard deviations for all variables

Variable	Mean	<u>SD</u>
Extraversion	57.39	10.39
Emotionality	32.44	8.43
Stress 1	11.00	5.27
Stress 2	10.92	5.14
Symptoms 1	7.89	6.29
Symptoms 2	8.71	6.41
Humour	17.45	3.17
Hardiness	.00	3.16
Coherence	55.37	11.05
Optimism	18.81	5.08

( $z = 48.55$ ,  $p < .001$ ). Scatterplot analysis revealed further suggestive violations of linearity and homoscedasticity. To correct for these violations, typical data transformations are normally implemented in order to normalize the distribution. However, because a curvilinear research model was defined with respect to extraversion-introversion and emotionality, a decision was made not to transform the variables whose assumptions were violated. These decisions were based on recommendations made by Bowerman, O'Connell, and Dickey (1986), Neter, Wasserman, and Kutner (1985), and Tabachnick and Fidell (1989) who argue that common transformations (e.g., logarithm, square root) have the effect of altering nonlinear data towards linearity, contrary to the needs of the present research.

One alternative in correcting for data whose statistical assumptions have been violated is to posit the existence of a different theoretical/statistical analogy, in this case, a quadratic interaction model. All further analyses, therefore, made use of the original raw data.

### Basic Level/Prototypical Predictor Evaluation

Note that in all cases, and as previously suggested, all specific moderators were significantly correlated with both extraversion-introversion and emotionality. To determine the best prototypical predictors of both extraversion-introversion and emotionality, stepwise multiple regression was utilized. See Table 7 for the output of both regression analyses. Note that for extraversion-introversion, the Coping Humour Scale and the Life Orientation Test (i.e., optimism) turned out to be the best and only prototypical predictors, suggesting that there was significant overlap amongst the moderators. For emotionality, the Sense of Coherence Scale, the Coping Humour Scale, and the Life Orientation Test were the best and only prototypical predictors. Personality hardiness failed to account for any significant amounts of explained variance in either analysis. All personality variables with the exception of hardiness were used in the superordinate analyses.

Table 7

Prototypical predictors for both extraversion-  
introversion and emotionality

Variables	R <sup>2</sup> Cumulative	R <sup>2</sup> Change	b	B
Extraversion-Introversion				
1. Humour	.11	.11	.82	.25
2. Optimism	.14	.04	.42	.20
Y-intercept			35.50	
Overall $F(2, 672) = 56.83, p < .0001$				
Emotionality				
1. Coherence	.32	.32	-.29	-.39
2. Humour	.38	.06	-.58	-.22
3. Optimism	.41	.03	-.34	-.20
Y-intercept			65.16	
Overall $F(3, 673) = 157.60, p < .0001$				

Note. b = Unstandardized Regression Coefficient;  
B = Standardized Regression Coefficient

### Superordinate Stress Moderator Analyses

All statistical moderation analyses implemented the forced variable entry procedure of hierarchical multiple regression. This approach to regression allows one to prespecify the order in which certain variables are to be entered into the analysis, unlike the stepwise procedure.

With respect to the superordinate analysis, once all main effects have been partialled out from the criterion (i.e., physical symptoms), all linear stress by personality, and quadratic stress by personality interaction terms are then entered into the equation. Note that the stress X stress X extraversion-introversion interaction term (i.e., quadratic) represents a test of Eysenck's assumptions in relation to the present research hypotheses. It is of interest to point out that some researchers (e.g., Baron & Kenny, 1986) have suggested that the most appropriate multiplicative interaction term is of the stress X moderator X moderator form. However, the weight of opinion appears to favour the squared stress by moderator term (see Martin, Kuiper, Olinger, & Dobbin, 1987; Mowday & Spencer, 1981; Parkes, 1986; Welford, 1973 for both theoretical and empirical illustrations).

For emotionality, a quadratic interaction term was included for exploratory purposes.

Because sex of participant, age of participant, and order of questionnaires were found to be correlated with a variety of personality, stress, and symptom measures (see Tables 4, 5), these variables were entered in causal order as the first covariates. This avoids the cumbersome task of running several multiple regression analyses and increasing the risk of a Type I error. Once all main effects have been entered into the equation, all linear and quadratic interactions follow. More specific procedures will be presented shortly. For both models (i.e., extraversion, emotionality) a significant multiple R-Square Change for each superordinate interaction term (linear, quadratic) indicates a superordinate moderating effect. It was expected that none of the stress by prototypical moderator interactions (linear, quadratic) would be significant. A significant prototypical interaction would indicate independent moderating effects. The results will now be presented.

1. Extraversion-Introversion. Because of limitations inherent in retrospective methodology regarding the direction of causality among variables, a more stringent and preferred prospective causal test

was carried out. Wave two physical symptoms served as the criterion. Once sex of participant, age of participant, and order of questionnaires were partialled out, wave 1 symptoms were also subsequently statistically controlled for in order to remove the effects of prior symptoms influencing all wave two variables. This was followed by a theoretical entry of stress time 2, extraversion, humour, optimism (i.e., in order of prototypicality) and finally the cross-product interactions. This prospective hierarchical procedure is in keeping with prior research recommendations (e.g., Nezu et al., 1988).

Analysis of the data revealed no significant moderating effects for extraversion-introversion or any of the prototypical interactions. However, main effects were observed for sex of participant, wave 1 physical symptoms, wave 2 stress, and sense of humour (see Table 8).

A series of comparisons was then carried out to determine the most parsimonious model that best fit the data. Applying the law of parsimony, an equation with the fewest predictors that explains as much variance in the criterion as one with more predictors would be the most preferable model to be retained (see Merhsion &

Table 8

Extraversion-Introversion as the superordinate stress  
moderator with wave two symptoms as the criterion

Variables	R <sup>2</sup>	R <sup>2</sup>	b	B
	Cumulative Change			
1. Sex	.05	.05**	-1.06	-.08
2. Age	.05	.00	.04	.02
3. Order	.05	.00	.04	.00
4. Symptoms 1	.39	.34**	.53	.49
5. Stress 2 (S-2)	.47	.08**	-.34	-.27
6. Extraversion (Ext)	.47	.00	-.04	-.07
7. Humour (Hum)	.48	.01*	.06	.03
8. Optimism (Opt)	.48	.00	-.19	-.16
9. S-2 X Ext	.48	.00	.01	.66
10. S-2 X Hum	.48	.00	-.06	-.81
11. S-2 X Opt	.48	.00	.04	.65
12. (S-2) <sup>2</sup>	.48	.00	.03	.55
13. (S-2) <sup>2</sup> X Ext	.48	.00	-.00	-.64
14. (S-2) <sup>2</sup> X Hum	.48	.00	-.00	.91
15. (S-2) <sup>2</sup> X Opt	.48	.00	-.00	-.73
Y-intercept			7.04	
Overall $F(15, 451) = 27.98, p < .0001$				

\*  $p < .05$

\*\*  $p < .0001$



Gorsuch, 1988). For this particular test, the full quadratic interaction model (all predictors) was first compared with the linear interaction model (all main effects plus all linear interactions). A comparison of the full quadratic interaction model with the restricted linear interaction model failed to reveal a significant difference in their multiple R-Squares ( $F[4, 450] = .72, ns$ ). To determine if the linear interaction model is the most parsimonious model a second comparison was subsequently conducted. This second test compared the full linear interaction model with the more restricted pure main effects model (main effects only). A comparison of the multiple R-squares once again failed to reveal a significant difference ( $F[3, 454] = .35, ns$ ). Therefore, the pure main effects model is the most parsimonious of all models when extraversion-introversion is the superordinate variable.

2. Emotionality. Table 9 presents the results when emotionality was utilized as the superordinate moderator. The ordering of variables into the regression equation followed the identical causal and theoretical entry sequence as that of the previous analysis. Sense of coherence, sense of humour, and dispositional optimism served as the prototypical

Table 9

Emotionality as the superordinate stress moderator  
with wave two symptoms as the criterion

Variables	R <sup>2</sup> Cumulative	R <sup>2</sup> Change	b	B
1. Sex	.05	.05***	-.98	-.07
2. Age	.05	.00	.05	.02
3. Order	.05	.00	.19	.01
4. Symptoms 1	.40	.35***	.52	.49
5. Stress 2 (S-2)	.47	.07***	-.84	-.66
6. Emotion. (Emot)	.48	.01**	.01	.02
7. Coherence (Coh)	.48	.00	-.15	-.26
8. Humour (Hum)	.49	.00*	.14	.07
9. Optimism (Opt)	.49	.00	.14	.07
10. S-2 X Emot	.49	.00	.00	.09
11. S-2 X Coh	.49	.00	.03	1.36
12. S-2 X Hum	.49	.00	-.07	-1.06
13. S-2 X Opt	.49	.00	.02	.33
14. (S-2) <sup>2</sup>	.49	.00	.03	.59
15. (S-2) <sup>2</sup> X Emot	.49	.00	.00	.13
16. (S-2) <sup>2</sup> X Coh	.49	.00*	-.00	-1.19
17. (S-2) <sup>2</sup> X Hum	.49	.00	.00	1.19
18. (S-2) <sup>2</sup> X Opt	.49	.00	-.00	-.39
Y-intercept			9.29	

Overall  $F(18,446) = 24.23, p < .0001$

\*  $p < .10$

\*\*  $p < .05$

\*\*\*  $p < .0001$

moderators. As in the previous analysis, no significant moderating effects were observed for either emotionality or for the prototypical moderators. However, sex of participant, wave 1 symptoms, wave 2 stress, and emotionality were all statistically significant in predicting wave 2 physical symptoms. In addition, marginal effects were observed for the Coping Humour Scale and the quadratic stress by sense of coherence interaction term.

A comparison of the full quadratic interaction model with the restricted linear interaction model failed to reveal a significant difference between both multiple R-squares ( $F(5, 445) = 1.32, ns$ ). A further comparison of the full linear interaction model with the restricted main effects model revealed, once again, no significant difference between the multiple R-squares ( $F(4, 450) = .23, ns$ ). Therefore, the pure main effects model turned out to be the best model in predicting the criterion when emotionality was implemented as the superordinate resource.

#### An Alternative Explanation?: Subject Mortality

One question that arises in the present study is whether or not there are differences between those who completed both wave 1 and wave 2 surveys as opposed to

those who only completed the wave 1 measures. If an effect was to be detected, it could be argued that differences were obtained because the wave 2 data were biased towards a restriction in score variation. Campbell and Stanley (1966) refer to this alternative explanation as subject mortality. Thus, it is possible that those who completed surveys from both waves were less physically symptomatic, less emotional, more hardy, more humourous, more coherent, more extraverted, and/or more optimistic than those who only completed the wave one surveys. Comparisons between these two groups on all measures yielded no significant differences. In addition, no differences were observed between any of the classes on any of the variables. It may be concluded, therefore, that neither subject mortality nor class membership affected the statistical analyses.

### Discussion

The primary objective of the present study was to develop and test a superordinate moderator model which could account for the stress buffering effects of more specific, basic-level resources. In doing so, a superordinate moderator model was developed around the cognitive theory of prototypes. In general, it was suggested that the vast array of stress moderators could be structured according to the requirements of prototype theory, or more specifically, graded structure and resemblance. As discussed previously, internal-graded structure refers to the extent that exemplars are prototypical of a superordinate category. In relation to the present study, it was asserted that stress moderators varied as prototypes of a superordinate resource. The second prototype concept is concerned with the patterned similarities that can be witnessed across exemplars of a particular superordinate category. This idea has been referred to as resemblance. It was suggested that evidence of resemblance among resources could be observed through the theoretical and empirical relations across one another. With this in mind, two sets of hypotheses were derived. Extrapolating from the expectations as set

out by Eysenck, it was first predicted that extraversion-introversion would moderate the quadratic relationship between daily stress and perceived symptomatology. For introverts, it was expected that the relationship between stress and symptoms would be positively linear. For extraverts, it was hypothesized that symptom reports would be exacerbated under low and high levels of stress, while attenuated at moderate levels. To test this, a stress X stress X extraversion-introversion interaction term was included in the superordinate regression analysis. The second general hypothesis was that emotionality would moderate the linear relationship between stress and symptoms. Specifically, it was expected that under high stress levels, emotionally reactive individuals would experience an elevation of symptom reports over those classified as less emotional. Based on previous research, a quadratic model was also developed for exploratory purposes. This discussion will first address the findings regarding the primary superordinate hypotheses; then it will consider secondary findings relative to the personality variables measured; and finally, it will offer some directions for further research.

### Superordinate Findings

Disappointingly, no evidence was found for either set of superordinate hypotheses. Subsequent model comparisons revealed that in both superordinate analyses a main effects model was found to best fit the data. In both cases, being female, having a high level of prior symptoms and stress, all consistently predicted elevated symptomatology one month later. In addition, humour seemed to function as a coping device that contributed to the reduction of physical symptom reports four weeks after testing. However, this was the case only when the superordinate variable was extraversion-introversion and not emotionality. This finding will be elaborated upon shortly. While extraversion-introversion failed to demonstrate any additive or interactive effects, emotionality was found to predict wave two physical symptoms. Note that emotionality only accounted for one percent of the variance in symptom reports once prior physical symptoms and stress were accounted for. This finding suggests that the effect of emotionality on symptomatology is weak and that emotionality may be confounded with psychosomatic distress (see Costa &

McCrae, 1985; Costa & McCrae, 1987; Ormel, 1983). Despite this, these findings lend partial support to Costa and McCrae's (1980) additive model of personality and happiness. To reiterate, Costa and McCrae first argue that extraversion-introversion and neuroticism (i.e., emotionality) are separately and respectively predictive of both positive and negative affect. Both mood components are then "subjectively balanced" resulting in a net state of happiness or well-being. Note that the neurotic (i.e., emotionally reactive individual), as opposed to both extraverted and introverted types, is assumed to possess an innate or learned tendency toward psychosomatic complaints or illness behaviour. As the present study revealed, highly emotional individuals tended to report being more symptomatic than the extraverted-introverted personality, thus corroborating in part the claims articulated by Costa and McCrae.

### Secondary Findings

One additional finding from this study was that when extraversion-introversion was used in the superordinate analysis, sense of humour significantly predicted diminished symptom reports one month after



initial administration. That is, the more one made use of humour as a coping device, the less physical symptoms one tended to experience. This appears to contradict the findings of Porterfield (1988) who found no significant relationship between coping humour and physical symptoms. Interestingly, this relationship was only marginally significant when emotionality was utilized as the superordinate variable, thus corroborating Porterfield's claim of a null relationship. These findings suggest that humour is marginally confounded with emotionality and that it may be difficult to separate the two constructs. If there is a humour-symptomatology connection, the relationship appears profoundly weak.

A second additional finding concerns the relationships between sex of participant and personality, stress, and health outcome. As Kobasa (1987) points out, while a great deal of research has focused on stress moderators in general, few investigators have examined gender differences among such variables. The need to examine such differences is made evident in the present study. In support of this the results indicated that male subjects were less extraverted, less emotional, more humorous, more

optimistic, less hardy, more coherent, and less stressed and distressed. Clearly, there is a need to consider gender as a significant variable in the stress/illness relationship.

As might be expected, prior physical symptoms and daily stress also predicted future symptomatology. These findings replicate previous research by a number of authors (e.g., Brown, 1984; Kanner, Coyne, Schaefer, & Lazarus, 1981) who suggest that chronic and proximal experiences of minor annoyances (i.e., daily stress) tend to aggravate and impair both psychological and physical well-being. Illustrating this process, Brown (1984, pp. 109-110) posits that hassles are just as stress provoking as any other form of stress when they are allowed to accumulate without relief. Dramatically, the endless occurrence of hassles drains one's coping resources, "dilutes our healing reservoirs and leaves our psyches vulnerable to assault." These findings suggest that the relationship between daily stress and well-being is robust and enduring.

A fourth set of findings is concerned with the relationships between the basic-level resources and the superordinate variables, extraversion-introversion and emotionality. While both of the superordinate variables

were correlated with all four basic level resources, the number of significant prototypical moderators varied between extraversion-introversion and emotionality. For extraversion-introversion, only two moderators were significant, sense of humour and optimism. These findings appear to corroborate the claims that extraversion-introversion is related to both humour (e.g., Bell, McGhee, & Duffey, 1986) and dispositional optimism (e.g., Kline & Storey, 1977).

When emotionality served as the superordinate variable, sense of coherence, sense of humour, and dispositional optimism turned out as the prototypical predictors. These findings clearly support prior claims that emotionality is related to sense of coherence (e.g., Carmel & Bernstein, 1989), sense of humour (e.g., Nemeth, 1979), and dispositional optimism (e.g., Staats, 1989). Note however that hardiness once again failed to predict the superordinate criterion variable. This latter finding appears to contradict the assertion that hardiness is confounded with emotionality. One explanation is that hardiness is more predictive of specific emotionality such as trait anxiety (e.g., Allred & Smith, 1989) than of the broader emotionality construct as operationalized in this research.

Along similar lines, it was previously suggested that sense of coherence may be confounded with emotionality. The results of the regression analysis appear strongly to support this contention as sense of coherence was able to explain upto 35% of the variance in emotionality. A second possible explanation for this finding is that sense of coherence effects a reduction in emotionality. In defence of this contention Antonovsky (1986) argues that those with a stronger sense of coherence are more adept at coping with stress. To support his claim Antonovsky uses data based on "qualitative" research (i.e., grounded theory), developed through a series of interviews with individuals of varying resiliency. While Antonovsky's assertions appear to be corroborated at the qualitative level, these claims seem to fail at the empirical and operational levels. That is, close examination of the sense of coherence short-form measure suggests that 9 of 13 questions are affect related (i.e., 1, 3, 5, 6, 7, 8, 9, 10, 11). For instance, question number 9 reads, "Does it happen that you have feelings inside you would rather not feel?" Questions based on these kinds of semantic intonations suggests that the relationship between sense of coherence and certain

health outcomes (c.g., trait anxiety; see Bernstein and Carmel, 1987) may be artificially inflated due to content similarity. Therefore, researchers need to be vigilant regarding the use of specific measures to assess a particular facet of personality, in this case, sense of coherence.

In a different vein, the fact that personality hardiness and sense of coherence failed to predict extraversion-introversion seems to suggest that each of these two basic-level resources bore some resemblance not only to one another, but also to both sense of humour and dispositional optimism. The intercorrelations among each of the variables appears to help bear this out. A similar case can also be made for the criterion of emotionality.

Furthermore, the finding that certain basic-level resources were more consistently predictive of the criterion than other resources seems to lend credence to the argument that the moderators are structurally graded. For instance, a consistent finding across both superordinate analyses was that humour tended to be more prototypical of both criteria than dispositional optimism. In sum, it appears that the present data set provides some support for a prototype application to stress moderator research.

### Future Research

There are several directions in which the present research could be developed. The possibilities include the evaluation of other potential superordinate personality variables such as the three remaining factors of the big five personality typology, namely, openness to experience, agreeableness, and conscientiousness. The present research made use of the big five's two primary components, extraversion-introversion and emotionality. As demonstrated by McCrae & Costa (1991), openness to experience, agreeableness, and conscientiousness have all been shown to "postdict" both positive and negative affect, affect balance, and life satisfaction. Other potential variables include locus of control and self-esteem (Cohen & Edwards, 1989).

It was previously suggested that moderator research seems to be plagued by resource redundancy. Recent concerns brought on by several authors (e.g., Korotkov, 1991; Nicholls & Licht, 1982) suggest that these relationships may be due to content similarity across measures rather than causal association. One other possible solution to this problem might be to

conduct a semantic analysis on all instruments that appear to resemble one another. To carry this out investigators could subject a wide variety of resource measures to an exploratory and confirmatory factor analysis to determine which variables are highly related to one another. Once a factor solution has been derived, a content analysis could be undertaken to evaluate the probable similarities across all test indicators. An evaluation of this kind may eventually aid the stress moderator field to reduce all or most apparent resource redundancy. Thus, researchers need to be cautious when choosing their measures in order to avoid misinterpretation.

One additional suggestion is to elaborate further on the stress moderator/prototype analogy. For instance, the present study suggested that certain stress moderators may be structured and explained along prototypical lines. However, the analogy seems plagued by a basic theoretical problem. That is, if prototype theory assumes that members or exemplars of a particular category are specific and distinct from those of other categories, how can we explain the finding that certain stress resources were found to be related to both superordinate variables? Although members of a superordinate category may bear some

resemblance to one another, their association across categories should be orthogonal. This appears to violate one of the central assumptions of prototype theory. However, before the model is rejected, one must more fully explore the relationship between a broader range of resilience factors and a particular superordinate variable. Because a large proportion of moderators appear to be interrelated, the amount of shared variance between a superordinate variable and a basic level resource depends on how many, and which variables are allowed to enter into the equation. That is, a large number of predictors may eliminate the significance of other variables, which on their own, were significant. Thus, a "full moderator set" may permit us to obtain a truer approximation of how prototypical a basic-level resource is in relation to a superordinate variable. This needs to be evaluated.

A final area of research proposes that a mediator, as opposed to a moderator model, be evaluated. While moderators are assumed to affect well-being through the appraisal of a potentially threatening event, mediators follow from an antecedent stressor to directly predict an outcome. In other words, stress is assumed to affect



well-being indirectly through the mediator variable (see Baron & Kenny, 1986 for a discussion on the distinguishing characteristics between both types of variables). Empirically, mediation analysis requires evaluating the relationship between two variables (i.e., stress and outcome) while controlling for the effects of a third variable. A variable is termed to be a mediator if the residual relationship between the two variables (i.e., stress and outcome) becomes negligible to the point of nonsignificance. Both top-down and bottom-up path models are critical in this vein. Put simply, while a bottom-up model views a particular concept as an outcome resulting from lower-order variables, the top-down view suggests the logical opposite, that these lower-order components result from the influence of a single latent predictor (see Kozma, Stones, & McNeil, 1991). To this end, it is suggested that a "Superordinate Mediator" model be developed to complement or serve as an alternative to the analogy proposed in this research. In general, one possible superordinate mediator model would essentially combine both top-down and bottom-up approaches. Using the terminology presented herein, a superordinate mediator could be assumed to be affected by basic-level

resources (Bottom-up). Driven by these prototypical variables, the superordinate mediator becomes exogenous to the outcome, that is, well-being (Top-Down; see Figure 6). To test this model of stress and personality, a series of structural equations are then developed. While the present study provides the essential methodological requirements to evaluate this model, the primary purpose of the present research was to develop and test the superordinate stress moderator model. The superordinate mediator model awaits testing.

#### Summary

A review of the stress resource literature suggests that the field is plagued by a lack of theoretical integration and moderator redundancy. To help resolve these concerns a superordinate stress moderator model was derived from the cognitive theory of prototypes. Using a prospective design, over 500 subjects were administered measures of stress, perceived symptoms, and personality over a four-week interval. The results failed to find any significant stress buffering effects for either of the superordinate variables, extraversion-

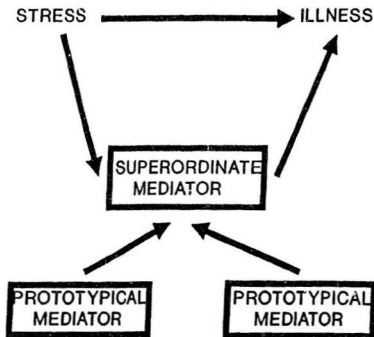


Figure 6. A superordinate mediation model.

introversion and emotionality, or for any of the prototypical moderator interactions. However, the results tended to support a pure main effects model, indicating that sex of participant, prior physical symptoms, daily stress, emotionality, and sense of humour were all significant in predicting physical symptoms at wave two of the study.

It was suggested that researchers concentrate their efforts on evaluating other potential superordinate moderators, such as openness to experience, agreeableness, and conscientiousness. In addition, attention should also be directed towards accounting for the effects of sex of subject, analyzing the content of resource measures, elaborating on the prototype/stress moderator analogy, and constructing a superordinate mediator as opposed to moderator model. Clearly, much needs to be done.

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## Appendix A

ADJECTIVE CHECK-LIST

INSTRUCTIONS: Below are a number of trait dimensions. Please rate yourself on each dimension by circling the most applicable number. Work quickly but accurately, your first impulse is probably the best. Please do not leave out any answers. Thank you.

1.....2.....3.....4.....5.....6.....7.....8.....9	
At ease	Nervous
1.....2.....3.....4.....5.....6.....7.....8.....9	
Affectionate	Reserved
1.....2.....3.....4.....5.....6.....7.....8.....9	
Loner	Joiner
1.....2.....3.....4.....5.....6.....7.....8.....9	
Insecure	Secure
1.....2.....3.....4.....5.....6.....7.....8.....9	
Quiet	Talkative
1.....2.....3.....4.....5.....6.....7.....8.....9	
Fun Loving	Sober
1.....2.....3.....4.....5.....6.....7.....8.....9	
Self-pitying	Self-satisfied
1.....2.....3.....4.....5.....6.....7.....8.....9	
Unemotional	Emotional
1.....2.....3.....4.....5.....6.....7.....8.....9	
Even-tempered	Temperamental
1.....2.....3.....4.....5.....6.....7.....8.....9	
High-strung	Relaxed
1.....2.....3.....4.....5.....6.....7.....8.....9	
Worrying	Calm
1.....2.....3.....4.....5.....6.....7.....8.....9	
Active	Passive
1.....2.....3.....4.....5.....6.....7.....8.....9	
Inhibited	Spontaneous
1.....2.....3.....4.....5.....6.....7.....8.....9	
Aloof	Friendly
1.....2.....3.....4.....5.....6.....7.....8.....9	
Sociable	Retiring
1.....2.....3.....4.....5.....6.....7.....8.....9	
Patient	Impatient

## Appendix B

CHS

Below you will find a list of seven statements. In the space at the beginning of each sentence, please indicate the degree to which you agree or disagree with that statement by writing a 1 (STRONGLY DISAGREE), 2 (MILDLY DISAGREE), 3 (MILDLY AGREE), or 4 (STRONGLY AGREE).

- 1 - STRONGLY DISAGREE
- 2 = MILDLY DISAGREE
- 3 = MILDLY AGREE
- 4 = STRONGLY AGREE

- \_\_\_\_ 1. I often lose my sense of humour when I'm having problems.
- \_\_\_\_ 2. I have often found that my problems have been greatly reduced when I tried to find something funny in them.
- \_\_\_\_ 3. I usually look for something comical to say when I am in tense situations.
- \_\_\_\_ 4. I must admit my life would probably be easier if I had more of a sense of humour.
- \_\_\_\_ 5. I have often felt that if I am in a situation where I have to either cry or laugh, it's better to laugh.
- \_\_\_\_ 6. I can usually find something to laugh or joke about even in trying situations.
- \_\_\_\_ 7. I has been my experience that humour is often a very effective way of coping with problems.

## Appendix C

OTL

INSTRUCTIONS. Here is a series of questions to various aspects of our lives. Each question has seven possible answers. Please mark the number which expresses your answer, with numbers 1 and 7 being the extreme answers. Answers 2 through 6 represent intermediate feelings.

1. Do you have the feeling that you don't really care about what goes on around you?  

1	2	3	4	5	6	7
Very seldom or never						Very often
  
2. Has it ever happened in the past that you were surprised by the behaviour of people whom you thought you knew well?  

1	2	3	4	5	6	7
Never happened						always happened
  
3. Has it happened that people whom you counted on disappointed you?  

1	2	3	4	5	6	7
Never happened						always happened
  
4. Until now your life has had:  

1	2	3	4	5	6	7
No clear goals or purpose at all						Very clear purpose
  
5. Do you have the feeling that you're being treated unfairly?  

1	2	3	4	5	6	7
Very often						Very seldom or never
  
6. Do you ever have the feeling that you are in an unfamiliar situation and you don't know what to do?  

1	2	3	4	5	6	7
Very often						Very seldom or never

7. Doing the things you do every day is:  
 1 2 3 4 5 6 7  
 A source of deep pleasure and satisfaction A source of pain and boredom
8. Do you have very mixed up feeling and ideas?  
 1 2 3 4 5 6 7  
 Very often Very seldom or never
9. Does it happen that you have feelings inside you would rather not feel?  
 1 2 3 4 5 6 7  
 Very often Very seldom or never
10. Many people--even those with a strong character--sometimes feel like sad sacks (losers) in certain situations. How often have you felt this way in the past?  
 1 2 3 4 5 6 7  
 Never Very often
11. When something happened, have you generally found that:  
 1 2 3 4 5 6 7  
 You overestimated or underestimated its importance You saw things in the right proportion
12. How often do you have the feeling that there's little meaning in the things you do in your daily life?  
 1 2 3 4 5 6 7  
 Very often Very seldom or never
13. How often do you have feelings that you're not sure you can keep under control?  
 1 2 3 4 5 6 7  
 Very often Very seldom or never



## Appendix D

PH

INSTRUCTIONS. Please indicate your reaction to each of the following items according to the following scale:

- 0 = Not at all true
- 1 = A little true
- 2 = Quite true
- 3 = Completely true

Please read the items carefully. Be sure to base all of your answers on the way you feel now. Do not spend too much time on any one item and please make sure you answer all questions. Space is provided beside each question for your response.

- \_\_\_\_\_ 1. Most of life is wasted in meaningless activity
- \_\_\_\_\_ 2. I find it difficult imagining having any enthusiasm for work.
- \_\_\_\_\_ 3. It doesn't matter if people work hard at their jobs; only a few profit.
- \_\_\_\_\_ 4. Ordinary work is too boring to be worth doing.
- \_\_\_\_\_ 5. The belief in individuality is only justifiable to impress others.
- \_\_\_\_\_ 6. Unfortunately, people don't seem to know that they are only creatures after all.
- \_\_\_\_\_ 7. The young owe the old complete economic security.
- \_\_\_\_\_ 8. A retired person should be free of all taxes.
- \_\_\_\_\_ 9. New laws should not be passed if they damage one's income.
- \_\_\_\_\_ 10. There are no conditions which justify endangering the health, food, and shelter of one's family or of one's self.
- \_\_\_\_\_ 11. Pensions large enough to provide for dignified living are the right of all when age or illness prevents one from working.

- \_\_\_\_ 12. Those who work for a living are being manipulated by the bosses.
- \_\_\_\_ 13. Thinking of yourself as a free person leads to great frustration.
- \_\_\_\_ 14. Often I do not really know my own mind.

INSTRUCTIONS: For the following items, please indicate by circling the appropriate letter which of the two statements in each item BETTER represents your attitude.

15. a) Becoming a success is a matter of hard work; luck has little or nothing to do with it.  
b) Getting a good job depends mainly on being in the right place at the right time.
16. a) As far as world affairs are concerned, most of us are victims of forces we can neither understand nor control.  
b) By taking an active part in political and social affairs the people can control world events.
17. a) Most people don't realize how much their lives are controlled by accidental happenings.  
b) There is really no such thing as "luck."
18. a) Sometimes I can't understand how supervisors arrive at work evaluations.  
b) There is a direct connection between how hard I work and the evaluations I get.
19. a) Many times I feel that I have little influence over the things that happen to me.  
b) It is impossible for me to believe that chance or luck plays an important role in my life.
20. a) What happens to me is my own doing.  
b) Sometimes I feel that I don't have enough control over the direction my life is taking.
21. Please indicate your age: \_\_\_\_\_
22. Please indicate your sex: Female \_\_\_\_\_ Male \_\_\_\_\_
23. Course Number: \_\_\_\_\_

## Appendix E

LOT

Put an X over the number that best describes the extent to which you agree with each of the following statements. At one extreme, 0 means you strongly disagree with the statement. At the other extreme, 4 means you strongly agree.

0 = Strongly  
disagree  
1 = Disagree  
2 = Neutral  
3 = Agree  
4 = Strongly  
agree

1. Things never work out the way I  
want them to.....0 1 2 3 4
2. I'm a believer in the idea that  
"every cloud has a silver lining"....0 1 2 3 4
3. In uncertain times, I usually  
expect the best.....0 1 2 3 4
4. I'm always optimistic about my  
future.....0 1 2 3 4
5. I hardly ever expect things to  
go my way.....0 1 2 3 4
6. I always look on the bright side  
of things.....0 1 2 3 4
7. If something can go wrong for me,  
it will.....0 1 2 3 4
8. I rarely count on good things  
happening to me.....0 1 2 3 4

## Appendix F

The Hassles Scale

HASSLES are irritants- things that annoy or bother you; they can make you upset or angry. Some hassles occur on a fairly regular basis and others are relatively rare. Some have only a slight effect, others can have a strong effect. This questionnaire lists things that can be hassles in day-to-day life.

DIRECTIONS. Please indicate on the right-hand side of the page how much of a hassle the item was during the PAST FOUR WEEKS by circling the appropriate number. Please work quickly but accurately.

0 = NONE, NOT  
APPLICABLE  
1 = SOMEWHAT  
2 = QUITE A BIT  
3 = A GREAT  
DEAL

- |   |   |   |   |   |
|---|---|---|---|---|
| 1. Home repairs.....                      | 0 | 1 | 2 | 3 |
| 2. Family-related obligations.....        | 0 | 1 | 2 | 3 |
| 3. Enough money for necessities.....      | 0 | 1 | 2 | 3 |
| 4. Being organized.....                   | 0 | 1 | 2 | 3 |
| 5. Social commitments.....                | 0 | 1 | 2 | 3 |
| 6. Your neighbourhood.....                | 0 | 1 | 2 | 3 |
| 7. Enough money for emergencies.....      | 0 | 1 | 2 | 3 |
| 8. Housework.....                         | 0 | 1 | 2 | 3 |
| 9. Enough money for extras.....           | 0 | 1 | 2 | 3 |
| 10. Enough money for further education... | 0 | 1 | 2 | 3 |

## Appendix G

M.U.S.S.

Put an X over the number for each statement that best describes HOW MUCH THAT PROBLEM HAS BOTHERED OR DISTRESSED YOU DURING THE PAST TWO WEEKS INCLUDING TODAY.

0 = Not at all  
 1 = A little  
     bit  
 2 = Moderately  
 3 = Quite a bit  
 4 = Extremely

- |                                  |   |   |   |   |   |
|----------------------------------|---|---|---|---|---|
| 1. Hands trembling.....          | 0 | 1 | 2 | 3 | 4 |
| 2. Dizziness.....                | 0 | 1 | 2 | 3 | 4 |
| 3. Heart pounding or racing..... | 0 | 1 | 2 | 3 | 4 |
| 4. Poor appetite.....            | 0 | 1 | 2 | 3 | 4 |
| 5. Feeling low in energy.....    | 0 | 1 | 2 | 3 | 4 |
| 6. Felt weak all over.....       | 0 | 1 | 2 | 3 | 4 |
| 7. Muscle cramps.....            | 0 | 1 | 2 | 3 | 4 |
| 8. Faintness.....                | 0 | 1 | 2 | 3 | 4 |
| 9. Headache.....                 | 0 | 1 | 2 | 3 | 4 |
| 10. Constant fatigue.....        | 0 | 1 | 2 | 3 | 4 |

## Appendix H

SHRO-B

Humour and laughter mean different things to different people. Each of us have our own conceptions of what kinds of situations are funny, our own notions of the appropriateness of humor in various situations, and our own sense of importance of humor in our lives.

In this questionnaire you will find descriptions of a number of situations in which you may have found yourself from time to time. For each question, please take a moment to recall a time when you were actually in such a situation. If you cannot remember such an experience, try to IMAGINE yourself in such a situation, filling in the details in ways that reflect your own experience. Then indicate in the appropriate space on the answer sheet the letter (a,b,c,d, or e) which corresponds to the phrase that best describes the way you have responded or would respond in such a situation.

1. You accidentally hurt yourself and had to spend a few days in bed. During that time in bed, how would you have responded?
  - (a) I would not have found anything particularly amusing.
  - (b) I would have smiled occasionally.
  - (c) I would have smiled a lot and laughed from time to time.
  - (d) I would have found quite a lot to laugh about.
  - (e) I would have laughed heartily much of the time.
2. If you got an unexpectedly low mark on an exam and later that evening you were telling a friend about it...
  - (a) I wouldn't have been amused.
  - (b) I would have been amused, but wouldn't have shown it outwardly.
  - (c) I would have been able to smile.
  - (d) I would have been able to laugh.
  - (e) I would have laughed heartily.

3. If you were crossing a street at a crosswalk and an impatient car driver, who had to stop for you, honked the horn...
- (a) I wouldn't have found it particularly amusing.
  - (b) I would have been amused, but wouldn't have shown it outwardly.
  - (c) I would have smiled.
  - (d) I would have laughed.
  - (e) I would have laughed heartily.
4. On days when you've had absolutely no responsibilities or engagements, and you've decided to do something you really enjoy with some friends, to what extent would you have responded with humour that day?
- (a) The activity we were engaged in would not have involved much smiling or laughter.
  - (b) I would have been smiling from time to time, but wouldn't have had much occasion to laugh aloud.
  - (c) I would have smiled frequently and laughed from time to time.
  - (d) I would have laughed aloud quite frequently.
  - (e) I would have laughed heartily much of the time.
5. If you were eating at a restaurant with some friend and the waiter accidentally spilled a drink on you...
- (a) I wouldn't have found it particularly amusing.
  - (b) I would have been amused, but wouldn't have shown it outwardly.
  - (c) I would have smiled.
  - (d) I would have laughed.
  - (e) I would have laughed heartily.
6. You thought you recognized a friend in a crowded room. You attracted the person's attention and hurried over to him/her, but when you got there you discovered you had made a mistake and the person was a total stranger...
- (a) I wouldn't have found it particularly amusing.
  - (b) I would have been amused, but wouldn't have shown it outwardly.
  - (c) I would have smiled.
  - (d) I would have laughed.
  - (e) I would have laughed heartily.

7. If you were having a romantic evening alone with someone you really liked (girlfriend, boyfriend, spouse, etc.)...
- (a) I probably would have tended to be quite serious in my conversation.
  - (b) I'd have smiled occasionally, but probably wouldn't have laughed aloud much.
  - (c) I'd have smiled frequently and laughed aloud from time to time.
  - (d) I'd have laughed aloud quite frequently.
  - (e) I'd have laughed heartily much of the time.
8. If there had been a computer error and you had spent all morning standing in line-ups at various offices trying to get the problem sorted out...
- (a) I wouldn't have found it particularly amusing.
  - (b) I would have been amused, but wouldn't have shown it outwardly.
  - (c) I would have smiled.
  - (d) I would have laughed.
  - (e) I would have laughed heartily.
9. You were travelling in a car in the winter and suddenly the car spun around on an ice patch and came to rest facing the wrong way on the opposite side of the highway. You were relieved to find that no one was hurt and no damage had been done to the car...
- (a) I wouldn't have found it particularly amusing.
  - (b) I would have been amused, but wouldn't have shown it outwardly.
  - (c) I would have smiled.
  - (d) I would have laughed.
  - (e) I would have laughed heartily.



10. If you were watching a movie or T.V. program with some friends and you found one scene particularly funny, but no one else appeared to find it humorous, how would you have reacted most commonly?
- (a) I would have concluded that I must have misunderstood something or that it wasn't really that funny.
  - (b) I would have "smiled to myself," but wouldn't have shown my amusement outwardly.
  - (c) I would have smiled visibly.
  - (d) I would have laughed aloud.
  - (e) I would have laughed heartily.
11. If you were eating in a restaurant with some friends and the waiter accidentally spilled some soup on one of your friends...
- (a) I wouldn't have found it particularly amusing.
  - (b) I would have been amused, but wouldn't have shown it outwardly.
  - (c) I would have smiled.
  - (d) I would have laughed.
  - (e) I would have laughed heartily.

## Appendix I

TO ALL RESPONDENTS

Thank-you for agreeing to participate in this research project. Attached to this cover sheet you will find several different different questionnaires. Please read all instructions and do not leave out any questions. Work quickly but accurately.

In order to match questionnaires for purposes of analysis, please generate a code by answering the following questions:

- (1) The last two digits of your MUN ID are\_\_\_\_\_.
- (2) The two digits representing the month of your birth are\_\_\_\_\_.
- (3) The two digits of the date of your birth are\_\_\_\_\_.

This information will make up your code. Anonymity of all data is guaranteed. All participation is voluntary. Please do not detach this sheet. Once again, thank-you for participating in this study.

## Appendix J

TO ALL RESPONDENTS--FINAL PHASE (II)

Thank-you for agreeing to participate in the final phase of this important research project. Your previous participation in Phase one was very appreciated and your responses most valuable. Attached to this cover sheet you will find only three brief questionnaires which are important for the completion of this investigation. Please read all instructions and do not leave out any questions. Please work quickly but accurately.

In order to match Phase 2 with Phase 1 questionnaires for purposes of analysis, please generate a code by answering the following questions:

- (1) The last two digits of your MUN ID are:\_\_\_\_
- (2) The two digits representing the month of your birth are:\_\_\_\_ (i.e., January = 01....)
- (3) The two digits of the date of your birth are:\_\_\_

Like Phase one, this information will make up your private code. Anonymity is guaranteed. For your benefit, all results will be made available to you at the earliest possible time, and where applicable, will be integrated into your course work for purposes of illustration. Participation in this research will in no way affect your course mark. All participation is voluntary. Please do not detach this sheet. Once again, thank-you for participating in this study.

Dave Korotkov





