AN ABSTRACT OF THE THESIS OF

Maureen C. Pierce for the Master of Science in Psychology presented on June 14, 1996

Title: The Effects of Hardiness, Exercise, and Stressful Life Events on the Onset of Illness

Abstract approved: [signature]

The purpose of this study was to investigate the relationships among personality hardiness, exercise, and stressful life events on the onset of illness. Participants included 240 volunteers (89 males and 151 females) whose median age was 19 years and who were enrolled in a lower level undergraduate psychology class at a midwestern state university. They completed a demographic questionnaire, the Dispositional Resilience Scale (DRS; Bartone, Ursano, Wright, & Ingraham, 1989), the Exercise Participation Questionnaire (EPQ; Roth & Fillingim, 1988), the Life Experiences Survey (LES; Sarason, Johnson, & Siegel, 1978) and a modified version of the Seriousness of Illness Rating Scale (SIRS; Brown & Siegel, 1988).

Results indicated that neither hardiness nor exercise affected the onset of illness. Specifically, no significant differences were found for the main effect of hardiness or exercise on the illness measure. However, examination of the data revealed individuals who experience a higher number of stressful life events reported a higher number of illnesses. Finally, Pearson product-moment correlations

indicated that stressful life events were correlated with the illness score. Participants who experienced a significant amount of stress also reported a greater amount of illneses. A slight, but statistically significant inverse correlation emerged between stressful life events and hardiness.

THE EFFECTS OF HARDINESS, EXERCISE, AND STRESSFUL LIFE EVENTS ON THE ONSET OF ILLNESS

A Thesis

Presented to

the Division of Psychology and Special Education

EMPORIA STATE UNIVERSITY

In Partial Fulfillment

of the Requirements for the Degree

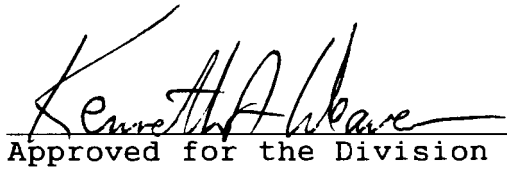
Master of Science

---

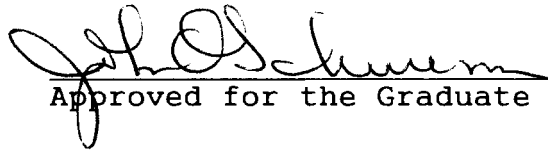
by

Maureen C. Pierce

August, 1996



Approved for the Division of
Psychology and Special Education



Approved for the Graduate Council

ACKNOWLEDGEMENTS

I would like to thank my committee members, Dr. Kurt Baker, Dr. Cooper Holmes, and Dr. Kathy Ermler for their expertise, encouragement, and guidance throughout the completion of this project. Much appreciation is extended to Bruce Johnson for his insightful perspective and unyielding support during my two year journey at Emporia State University.

TABLE OF CONTENTS

Page

Acknowledgements iii

List of Tables v

Chapter

1: Introduction 1

Definition of Terms. 3

Hardiness 4

Exercise. 10

Stressful Life Events and Ilness Onset 13

Conclusion and Hypotheses 14

2: Methods 17

Paricipants and Sampling Procedure 17

Research Method 17

Instrumentation 17

Procedure 23

3: Results 24

4: Discussion 31

References 36

Appendices 43

Appendix A 43

Appendix B 45

Appendix C 47

Appendix D 49

LIST OF TABLES

Table Page

1. Descriptive statistics for hardiness, exercise, and stressful life events 25

2. Means, standard deviations, and cell frequencies for the Seriousness of Illness Rating Scale broken down by hardiness, exercise, and stressful life events 26

3. Analysis of Variance for the effects of hardiness, exercise, and stressful life events (SLE) on illness 28

4. Correlations for illness, hardiness, exercise, and stressful life events (SLE) 30

CHAPTER 1

Introduction

A substantial amount of research has indicated that stressful life events contribute to the development of health problems. Between 60% and 90% of visits to health care professionals are for stress-related disorders (Pelletier & Lutz, 1989). Stress is a major factor in a wide range of conditions including hypertension, cardiovascular disease, tension headaches, and decreased immunological functioning (Pelletier & Herzing, 1988).

Exposure to stressors can affect people in a variety of ways. These effects can be physical, psychological, and social. They may be subtle or dramatic, and they may occur immediately or manifest themselves over a lifetime. Since stress is a normal part of life, researchers began to identify variables or resistance resources that may interact with life stress to moderate the stress-illness relationship. Moderator variables are those characteristics of individuals or their environments that make them more or less vulnerable to the negative effects of stressful events (Baron & Kenny, 1986). Such moderators include personality characteristics, social support, family history, locus of control, and health practices such as exercise.

With the mounting stress and expectations of contemporary society, people are becoming ever more health

conscious and concerned about their health. As a result, people are turning to exercise, not only as a means of stress reduction, but also for the long-term health benefits.

The purpose of the present study was to examine the independent or combined moderator effects of hardiness and exercise as they relate to the stress-illness association. Such consideration focused on the use of more sensitive and updated measures of hardiness and exercise participation than have been used previously.

Currently, there is a great deal of interest in determining ways in which the deleterious effects of stress can be reduced. The results of this study and other available research may address whether or not certain health practices of hardy individuals will inoculate them more effectively against stress. Since stressful life events are unavoidable, it seems practical that clinical psychologists, health psychologists, and behavioral medicine specialists can teach hardiness techniques and implement exercise regimes in their treatment paradigms. Patients in hospitals, clients in stress reduction clinics, or employees in worksite wellness programs may all reap the benefits of such efforts. Prevention efforts can address less invasive forms of treatment for physical problems that may be more cost effective for both patient and health provider. Additionally, disseminating information and

providing treatment options offers individuals a sense of control over their health and reactions to illness. Overall, people will be able to respond, instead of react to the inevitable stress of life.

The role of exercise has been implicated in influencing immune system functioning (Jemmott & Locke, 1984; Pelletier & Herzing, 1988) and temporarily increasing neurotransmitter levels, such as norepinephrine, after exercise (Roth & Holmes, 1985). If the role of exercise participation as a moderator variable is clarified, then prescriptions for exercise could become tailored to address certain treatment goals.

Definition of Terms

There appears to be some terminological confusion regarding the nature of variables thought to modify the stress-illness relationship. Specifically, some researchers use the terms "moderator" and "mediator" interchangeably to refer to the same variable. However, these two variables have different meanings and require different types of statistical analysis. Mediators are variables that exist between other variables in a causal system. They are usually analyzed using path analysis or structural equation procedures. Moderators are variables that interact with a causal agent. They are usually analyzed using multiple regression or analysis of variance techniques. This research will examine the possible

moderating role hardiness and exercise play in the stress-illness relationship (Baron & Kenny, 1986; Roth & Holmes, 1985).

Listed below are other terms and definitions used in this study.

Stressful life event - A set of circumstances that signifies or requires a change in the individual's ongoing life pattern (Rabkin & Struening, 1976).

Stress resistance resources - Otherwise known as moderators of stress. These could include coping strategies such as good health habits including exercise, social support, and personality (Gentry & Kobasa, 1984).

Coping strategies - The specific ways of perceiving, interpreting, and acting in the face of stressors that minimize their threat and lessen the degree of negative arousal evoked (Gentry & Kobasa, 1984).

Hardiness - A constellation of personality traits that operate as a resistance resource when stressful life events are experienced (Kobasa, 1979).

Hardiness

The concept of hardiness as a personality construct that moderates stress-illness relationships was first introduced by Kobasa (1979). Kobasa's conceptualization of hardiness as the personality style for stress resistance is

derived from an existential theory of personality. According to Kobasa, hardy individuals become ill less often because they manifest three adaptive personality characteristics: control, commitment, and challenge. Each component involves cognitive and behavioral strategies that are predicted to protect one from experiencing the adverse physical effects of stress. Specifically, hardy persons believe they can control or influence the events they experience and believe they can make things happen. People who are high in commitment tend to feel fully engaged in what they are doing from day to day and are committed to giving these activities their best effort. Challenge represents the belief that change is a natural part of life that provides an opportunity for personal growth (Kobasa, Maddi, & Courington, 1981). This view allows stress-hardy individuals to see new situations as a challenge, instead of as a threat or as something to be feared. As a result, all three dimensions interact to buffer the effects of the stress-illness relationship.

Hardiness involves a particular way of seeing oneself and the world. Specifically, high hardy individuals respond to stressful situations by cognitively transforming a stressful event (Gentry & Kobasa, 1984; Kobasa, Maddi, & Puccetti, 1982). These individuals exert control over internal and external events, perceive change to be the norm, and respond by taking decisive action. Hence,

hardiness is thought to serve a protective function because it reduces the stressfulness of an event. In comparison, low hardy people engage in more maladaptive coping such as avoidance and denial. Therefore, hardiness is hypothesized to influence (a) the cognitive appraisal of stress, (b) the coping efforts made to manage perceived stress, (c) health practices that in turn reduce illness, and (d) physiological arousal (Wiebe & Williams, 1992).

Hardiness has been consistently found to influence the manner in which stressors are appraised. High hardy individuals generally report more positive perceptions of the same event than do those low in hardiness. Furthermore, high hardiness has been associated with lower levels of negatively appraised stress, which, in turn, has been associated with fewer symptom reports and more positive health behaviors (Banks & Gannon, 1988; Rhodewalt & Agustsdottir, 1984; Rhodewalt & Zone, 1989; Wiebe & McCallum, 1986). Finally, Allred and Smith (1989) demonstrated that high hardy participants make more positive self-statements in response to evaluative threat than do low hardy subjects. Kobasa, Maddi, and Kahn (1982) argued this type of stress appraisal mitigates the potential unhealthy effects of stress and prevents the physical strain that often leads to illness. However, what remains to be demonstrated is whether these appraisal differences translate into actual differences in health.

Hardiness not only influences how stress is appraised, but also impacts the manner in which one manages perceived stress. For example, Wiebe (1991) found hardy people made more attempts at a frustration tolerance task. The scores on the frustration task reflected increased persistence in the face of difficulty. Further, high hardy individuals are more likely to adopt coping strategies that are more active and problem-focused. In contrast, low hardy people try to avoid the problem and deny the existence of a stressful life event (Williams, Wiebe, & Smith, 1992). Such perseverence and problem focused coping is characteristic of high hardy individuals who have reported lack of avoidance and behavioral disengagement on self-report measures of coping.

Several investigations have examined the relationship between hardiness and health behaviors. Health practices such as proper diet, exercise, and decreased smoking have been identified as variables affecting health. During times of stress and increased demands, certain health practices may not be used faithfully and eventually encourage the development of illness. Wiebe and McCallum (1986) concluded hardiness works indirectly through health practices. Thus, hardy individuals may remain more healthy under stress because they engage in more and better health behaviors than their non-hardy counterparts.

Overall, both life stress and departing from certain

health behaviors have been shown to correlate significantly with future illness measures.

Information thus far suggests that hardiness is related to stress appraisal and coping in meaningful ways. Hardiness-related appraisals and coping strategies also appear to influence physiological arousal. Specifically, the appraisal style of hardiness results in decreased sympathetic arousal to stressors, thus reducing the long-term health consequences of stress (Kobasa, Maddi, Puccetti, & Zola, 1985). Wiebe (1991), for example, found high hardy men exhibited lower heart rate elevations during an evaluative threat task than did low hardy men. However, few studies have tested the physiological correlates of hardiness, and existing studies have yielded inconsistent data. Some researchers have found high hardy male participants displayed higher systolic blood pressure to an evaluative threat task, whereas others have reported subjects display a reduced diastolic blood pressure responsivity to a mirror-tracing task (Allred & Smith, 1989; Contrada, 1989). The cause of such conflicting results is unclear. These differences may be due to the use of different subject samples, different measures of hardiness, and different stressors.

There are several methodological and conceptual concerns in hardiness research. Previous research on hardiness is difficult to integrate because a number of

different subscales have been used to measure hardiness (Funk, 1992; Funk & Houston, 1987; Hull, Van Treuren, & Virnelli, 1987). It is difficult to determine if the health outcomes across studies are real differences or if these differences just reflect differences in the hardiness scales used.

Despite the plethora of hardiness research, whether or not hardiness buffers or moderates the stress-illness relationship is unclear. Some studies have found buffering effects on illness (Kobasa, Maddi, & Kahn, 1982; Kobasa, Maddi, & Puccetti, 1982; Rhodewalt & Zone, 1989), whereas others have cited discrepant findings (Banks & Gannon, 1988; Funk & Houston, 1987; Kobasa et al., 1981).

Hardiness operates independently of other stress resistance resources such as social support and exercise. Kobasa, Maddi, and Puccetti (1982) concluded that hardiness and exercise have different roles in protecting the individual from becoming ill. Hardiness operates by transforming the stressful events themselves, whereas exercise reduces physical strain. However, the exercise measure used in Kobasa's study was a four item questionnaire and was limited in its capacity to tap into the construct of interest (Roth, Wiebe, Fillingim, Shay, 1989). At present, whether exercise or hardiness operate independently or in combination with other resistance

resources to produce additive stress-resistant effects is not clear.

Exercise

Participation in physical exercise and physical fitness have been identified as variables for building stress resistance. The benefits of regular physical exercise include reduced incidence of physical health problems (Pelletier & Herzing, 1988), elevated mood states (Folkins & Sime, 1982), and an overall positive self concept (Hughes, 1984). However, evidence that exercise participation and high levels of fitness are responsible for weakening the influence of stressors on health has only recently emerged. In addition, whether exercise specifically buffers the stress-illness relationship is not clear. The question remains: How frequent and intense does exercise need to be in order to serve a protective function? Leon (1994) reported that for exercise to be considered effective, one had to participate in strenuous, aerobic exercise 5 days a week for a minimum of 45 minutes. If this criterion is not met, then health benefits from exercise are considered minimal at best. Other researchers have reported that aerobic exercise training of only five weeks may contribute to a buffering effect of acute stressors (LaPierre, Antoni, & Schneiderman, 1990). Hence, the degree in which exercise can protect health is open for discussion.

Exercise reportedly protects health by enhancing physical and emotional resilience. The evidence seems to be most complete for cardiovascular disorders. Vigorous exercise has been found to decrease the likelihood of heart attacks by increasing the efficiency of cardiac action, slowing the heart, and regulating the rhythm of the heart (Kobasa et al., 1985; Paffenberger & Hale, 1975). Cardiac patients who were assigned to an exercise condition showed greater improvement in cardiac functioning and self-concept than those who received only routine care (Roth & Holmes, 1987). Furthermore, Roth and Holmes (1985) found that highly stressed college students with high levels of aerobic fitness reported fewer physical health problems and fewer symptoms of depression over a two month period as compared to highly stressed college students with low fitness levels. Additionally, high stress college students who had participated in an exercise program exhibited greater decreases in depression as compared to students who had received relaxation training or no treatment at all (Roth & Holmes, 1987). Brown and Siegel (1988) examined stressful life events, exercise habits, and health status among adolescents. They found that stress and exercise interacted to predict changes in health over time. These studies suggest that exercise and fitness may provide both preventive and therapeutic benefits by interfering with the stress-illness associations.

A few experiments provide some evidence that fitness may play a role in autonomic reactivity to certain stressors. High fit participants exhibited smaller increases in pulse rates (Roth & Holmes, 1985) and showed faster autonomic recovery from stress, while low fit individuals responded to a distressing film with a greater elevation in blood pressure (Keller & Seraganian, 1984). In a second study by Keller and Seraganian, participants who received exercise training improved significantly in physical fitness and showed faster recovery in an electrodermal response. These studies suggest that this quicker autonomic recovery may allow the aerobically fit to cope more effectively with emotional stress.

Kobasa, Maddi, and Kahn's (1982) research on personality and exercise indicated that exercise operates to relieve physical and mental strain directly. The buffering effects seem additive in that persons who are both hardy and exercise are healthiest. Subsequent research by Kobasa and Puccetti (1983) underscored the importance of the joint effects of personality, exercise, and social support as resources in reducing the likelihood of illness. The likelihood of illness increased from 7.69% in persons with all three resources (i.e., control, commitment, and challenge) available to 57.69%, 71.87%, and 92.85% in persons with only two, one, or no resistance resources, respectively.

Stressful Life Events and Illness Onset

In the present study, stress was measured by the total number of life changes an individual has experienced over a six month time period. A stressful life change or life event is operationally defined in terms of self-reported life changes such as death of a family member, change in residence, borrowing money for a student loan, or breaking up with a boyfriend or girlfriend (Dohrenwend & Dohrenwend, 1974; Sarason, Johnson, & Siegel, 1978). Numerous studies have documented that a relationship exists between life stress and susceptibility to illness. Both Rabkin and Struening (1976) and Sarason et al. found a relationship between life stress and major and minor health changes.

More recently, Brown and Siegel (1988), Kobasa, Maddi, and Puccetti (1982), and Roth et al. (1989) have demonstrated that life change is related to a decline in physical health. Although research on life events consistently shows significant positive correlations between stressful events and illness, the magnitude of these correlations is not pronounced (Rabkin & Struening, 1976). The purpose of life events research is to demonstrate a temporal association between the onset of illness and a recent increase in the number life changes. The impact of such events is presumed to be additive in that more events are expected to have greater effect.

Some people manifest physical and psychological

reactions to stress after exposure to stress conditions, while others do not (Kobasa et al., 1981; Roth & Holmes, 1985). Illness onset is generally associated with a number of potential variables other than the exposure to stressors alone. These factors include the intensity and duration of the stressor (Rabkin & Struening, 1976), the appraisal of the significance of potentially threatening events (Wiebe & McCallum, 1986), personality (Kobasa, 1979), and social support (Shumaker & Hill, 1991). Given these concerns, anthropomorphic factors that could moderate the effects of such stress-illness associations are important. Therefore, the present study is interested in how exercise and a hardy personality style could influence the relationship between life change and illness onset.

Conclusion and Hypotheses

The interrelationship between individual factors and situational aspects of stress illustrate the complexity of the study of stress and health. A growing body of evidence indicates that regular exercise can assist people in responding to certain psychosocial tasks (Brown, 1991; Keller & Seraganian, 1984; Roth & Holmes, 1985). In this regard, exercise can work in conjunction with personality to improve stress resistance. In sum, more research is needed to explore the hypothesis that hardiness affects health both generally and specifically under conditions of high stress.

The possibility that hardy individuals engage in and adhere to more healthful behaviors appears consistent with the concept itself. Individuals who are more committed to themselves may engage in more self-protective behaviors. Those who perceive more control over life events should also be more perceptive of the association between their behavior and their health and therefore be more likely to engage in positive health practices. Those who perceive more control over life events should also be more cognizant of the association between their behavior and their health and therefore be more likely to engage in positive health practices. Those high in challenge may be more determined to adhere to a beneficial health action such as an exercise regime (Hannah, 1988; Wiebe & McCallum, 1986).

Whether exercise and hardiness are independent moderators of stress is not clear. These might both aid stress resiliency by the same or separate processes, or they may be indexing the same underlying stress-resistant attributes. However, hardy people might be more likely to lead a healthier lifestyle that includes exercise, which may, in turn, lead to reduced incidence of illness. Alternately, exercise may lead to higher levels of hardiness and subsequent improved health. Both of these hypotheses would imply that exercise and hardiness are interrelated variables whose health benefits overlap considerably.

Hardiness and exercise have a buffering effect on stress. Consistent with these findings, participants with higher hardiness scores were hypothesized to have fewer number of reported illnesses. Conversely, when only one resistance resource is relied upon, the probability of illness increases. The literature supports the benefits of the buffering effects of a combination of hardiness and exercise. Based on these findings, hardiness and exercise, in combination, were hypothesized to be more important in buffering the deleterious effects of stress than either is alone. Furthermore, in support of previous research, participants who report high amounts of stress were hypothesized to indicate high levels of illness, whereas high hardiness and exercise participation will report low levels of illness (Kobasa, Maddi, & Puccetti, 1982). The last hypothesis was drawn from the previous three hypotheses. Specifically, individuals who are stress hardy, exercise frequently, and experience a high number of stressful life events will experience significantly less illness than those who are low in either exercise or hardiness with high levels of stress.

CHAPTER 2

Methods

Participants and Sampling Procedure

This study utilized 240 college men and women from introductory and developmental psychology courses at a small Midwestern university. The students received partial credit toward an introductory psychology class for their voluntary participation. The participants' median age was 19 years (range 18 to 44 years). The Institutional Review Board for the Treatment of Human Participants at Emporia State University approved the research for the use of human participants.

Research Method

The research method used in this study was a causal comparative design. This design was the most logical to implement because the study investigated differences that already existed in terms of hardiness, exercise, and the amount of stress an individual was experiencing and how these differences would impact the onset of illness. By utilizing this design, differences were examined based on group membership such as high and low hardiness.

Instrumentation

Four questionnaires were employed in this study to test the hypotheses. These questionnaires assessed the level of hardiness, participation in certain exercise activities, number of stressful life events, and illness

symptoms for each individual. Demographic information was obtained from an accompanying demographic profile sheet.

Hardiness. The Dispositional Resilience Scale (DRS; Bartone, Ursano, Wright, & Ingraham, 1989) is a 45-item self-descriptive rating scale used to measure the construct of hardiness. Participants indicated on a 4-point scale the degree to which they agreed with each item. The DRS is a slightly modified version of the original hardiness scale used by Kobasa (1979). The DRS has several advantages over other hardiness scales. For example, the DRS includes more positively keyed items and uses an equal number of items to measure the subfactors of committment, control, and challenge. In addition, the items and scoring for this scale are readily available (Funk, 1992; Funk & Houston, 1987). The result is an instrument that discriminates respondents well and produces composite hardiness scores that reliably differentiate along the dimensions of commitment, control, and challenge. Participants respond to each item by indicating the extent they agree or disagree with a given statement. Responses are recorded on a four-point Likert scale ranging from "not at all true" to "completely true." The internal consistency coefficients for the subscales are .82 (Commitment), .66 (Control), and .62 (Challenge). For the composite score, Cronbach's alpha was reported at .85 (Bartone et al., 1989). Information on the DRS test-retest reliability is not available. However,

the DRS is reported to replicate the major findings regarding the stress-illness relationship reported in the literature (Bartone et al., 1989; Funk, 1992).

Exercise. There is currently little consensus in the literature regarding how best to assess physical activity level by self-report (Washburn & Montoye, 1986). Some instruments measure the amount of time spent in specific physical activity; others provide a more general assessment of physical activity level. Time frames also differ among instruments. Some measures focus on activity level over an extended period of time (e.g., 1 year), whereas others assess activity level for a shorter period of time (e.g., 1 week).

The Exercise Participation Questionnaire (EPQ; Roth & Fillingim, 1988) was used to assess self-reports of physical exercise. The EPQ was used because it is the most inclusive and current of the exercise questionnaires. Although no data exist for the relability and validity, the EPQ has been used in other studies assessing exercise participation, hardiness, and life events (Roth & Fillingim, 1988; Roth et al., 1989). This questionnaire assessed current activity level by having participants indicate the amount of involvement in 15 common exercise activities including both aerobic (e.g., jogging, swimming) and anaerobic (e.g., weight lifting) forms of exercise. Additional space was provided for participants to enter any

other types of exercise not on the list. For each item, participants provided information on the frequency, duration and intensity of the workout. In addition, in this study, participants indicated the month and year of the activity they had been engaging in the longest and on a continual basis in order to assess whether particpants had started a new exercise program within the last month. This was done to identify a possible link between beginning a new exercise program and subsequent illness. An estimate of aerobic exercise participation was obtained by scoring the responses according to Cooper's aerobic points scoring system. The total exercise minutes score was used to categorize participants into one of two groups: active or not active. According to the American College of Sports and Medicine guidelines, active participation is defined by exercising three times a week with each session lasting 60 minutes (Dishman, 1994). Exercising fewer than three times a week for less than 60 minutes describes one as not active (Dishman, 1994).

Stressful Life Events. Stressful life events were measured with the Life Experiences Survey (LES; Sarason et al., 1978). The LES is a 57-item self-report measure used to assess the occurrence and impact of various stressful life experiences. The LES is a well-established life events measure that has been used in numerous investigations of stress and illness (Brown, 1991; Roth et

al., 1989). It was chosen for use in this research because it has a number of items of particular relevance to college students (e.g., moving away from home for the first time). Participants indicated whether they had experienced the event over the past 6 months and to rate the degree of impact of each event experienced on a 7-point scale (-3 = extremely negative impact, 0 = no impact, 3 = extremely positive impact). Additional space was provided for participants to record any other significant events they had experienced in the previous 6 months. Stress was scored by counting the number of life events reported as negative and summing the self-report ratings of those events (e.g. summing events rated -1, -2, -3). Two test-retest reliability studies of the LES have been conducted by Sarason et al. (1978). The coefficients for the total life change were .65 and .64 (Sarason et al.).

Illness. A modified version of the Seriousness of Illness Rating Scale was used to assess physical health (Brown & Siegel, 1988; SIRS; Wyler, Masuda & Holmes, 1968). Despite the lack of data on the reliability and validity of the modified version, it has served frequently as a tool in stress and illness studies (Brown, 1991; Brown & Siegel, 1988). An invesigation by Kobasa et al. (1981) has provided evidence for its validity in assessing physical illness. Brown and Siegel (1988) modified the questionnaire for a college population. Hence, all SIRS

items that lacked relevance to a sample of traditional college students (e.g., menopause) and those activities that were associated with physical activity level (e.g., obesity), were deleted from the measure, leaving a total of 39 medical conditions and physical illnesses. These items range in severity from the common cold or sore throat to diabetes and cancer. As with the stressful life events, participants indicated which of the conditions they had experienced in the last six months. The present study modified the questionnaire to include blanks for other illnesses. Illness scores were derived by summing the number of illnesses reported.

Procedures

Test administration took place in small groups during a scheduled time in a classroom environment. Once the general procedures of the study were explained, each participant was given an informed consent form and instructed to read the printed directions on the form (Appendix A). After all the consent forms were returned, participants were given a questionnaire packet including a demographic form (Appendix B) and four self-report questionnaires that were completed at their own pace. To minimize threats to internal validity, the questionnaire packets were distributed in counterbalanced order at each session. In order to preserve confidentiality, the students were instructed not to put their names on any of

the handouts and that the information would be tabulated based on a code number.

Finally, all participants received a concise debriefing letter upon completion of the questionnaire packet (see Appendix C). All instructions by the experimenter were delivered via a prepared script (Appendix D). Although no time limit was imposed, the testing procedure required approximately 30 minutes for completion.

CHAPTER 3

Results

Participants included 89 male and 151 female undergraduate students from a small Midwestern university who received partial credit toward an introductory or developmental psychology course. Of the 240 participants, 90% were white, 3% were black, 4% were hispanic, and 3% were either Asian or identified as "other." The median age of the participants was 19 years with an age range between 18 to 44 years. Marital status included 89% single, 6% married, 1% separated, and 3% divorced. Descriptive statistics for hardiness, exercise, and stress are presented in Table 1. Table 2 presents means, standard deviations, and frequencies for each cell of the ANOVA.

The present study employed a factorial design in which the main and interaction effects between three variables were investigated. The distribution of scores from the hardiness and life events questionnaires were split at the sample median into categories of high and low. This yielded a 2 (Hardiness: high or low) X 2 (Exercise: active or not active) X 2 (Stressful Life Events: high or low) factorial design. An analysis of variance (ANOVA) was performed with personality based hardiness, exercise participation, and stressful life events as the independent variables and illness as the dependent variable.

An ANOVA was performed in order to determine group

Table 1

Descriptive Statistics for Hardiness, Exercise, and Stressful Life Events

Variable	Mean	SD
Hardiness	87.49	9.94
Control	28.60	3.84
Commitment	39.60	5.25
Challenge	19.29	3.37
Exercise	1.81	.39
Stressful Life Events	1.52	.50

Table 2

Means, Standard Deviations, and Cell Frequencies for the Seriousness of Illness Rating Scale by Hardiness, Exercise, and Stressful Life Events

	Hardiness								
	Low			High					
	Stress			Stress			Stress		
Exercise	Low	High	Total	Low	High	Total	Low	High	Total
Not Active	5.00	7.28	6.45	4.06	6.50	4.88	4.38	7.00	5.63
	(1.77)	(2.89)	(2.74)	(3.04)	(2.07)	(2.95)	(2.68)	(2.60)	(2.93)
	(8)	(14)	(22)	(16)	(8)	(24)	(24)	(22)	(46)
Active	4.45	5.90	5.24	4.42	6.22	5.34	4.43	6.06	5.29
	(2.88)	(3.19)	(3.12)	(2.54)	(3.90)	(3.41)	(2.69)	(3.54)	(3.26)
	(44)	(52)	(96)	(48)	(50)	(98)	(92)	(102)	(194)
Total	4.54	6.20	5.35	4.33	6.26	5.24	4.42	6.23	5.35
	(2.73)	(3.16)	(3.20)	(2.66)	(3.69)	(3.32)	(2.68)	(3.40)	(3.20)
	(52)	(66)	(118)	(64)	(58)	(122)	(116)	(124)	(240)

differences for the independent variables and to examine the possible relationship to illnesss. In addition, Pearson product-moment correlations were calculated to identify relationships between continuous variables. In all analyses, an alpha level of .05 was used.

Results of this ANOVA revealed a significant main effect for stress, $F(1, 232) = 14.21$, $p < .001$. As hypothesized, individuals who experienced a higher number of stressful life experiences reported a greater number of illnesses. No significant differences were found for hardiness, $F(1, 232) = .47$, or exercise, $F(1, 232) = .77$. The analysis revealed no significant interactions among hardiness and exercise, $F(1, 232) = .06$, hardiness and stress, $F(1, 232) = .06$, stress and exercise, $F(1, 232) = .48$, and hardiness, exercise, and stress, $F(1, 232) = .01$. Table 3 summarizes the results of the ANOVA.

To test the hypothesis that a new exercise program would result in higher numbers of self-reported illness, a one-way ANOVA was conducted. No significant differences were found between participants who exercise and those who do not on the illness measure, $F(1, 192) = .156$. Except for the main effect of stress, power analysis indicated insufficient power for all main and interaction effects (Cohen, 1988).

As secondary analysis, Pearson product-moment coefficients were computed among hardiness, exercise, stressful life events, and illness and are summarized in

Table 3

Analysis of Variance for the Effects of Hardiness, Exercise, and Stressful Life Events (SLE) on Illness

Source	SS	df	MS	F	p	Power
Main Effect						
Hardiness	4.47	1	4.47	.47	.495	.095
Exercise	7.76	1	7.36	.77	.382	.174
SLE	136.30	1	136.30	14.21	.000	.963
Two-way interaction						
Hardiness by SLE	.55	1	.55	.06	.811	.042
Hardiness by Exercise	8.58	1	8.58	.89	.345	.173
SLE by Exercise	4.63	1	4.63	.48	.488	.105
Three-way interaction						
Hardiness by SLE by Exercise	.09	1	.09	.01	.924	.033
Error	2225.47	232	9.59			

Table 4. Not suprisingly the three hardiness subscales, control, commitment, and challenge, were positively correlated with the composite hardiness score. As expected, stressful life events were correlated with the illness score. Participants who experienced a significant amount of stress also reported a greater number of illnesses. Self-reported exercise participation, however, was not correlated with the illness measure. Nor was there a statistically significant correlation between the illness and hardiness measures (composite and subscales). A slight, but statistically significant inverse correlation emerged between stressful life events and hardiness.

Table 4

Correlations for Illness, Hardiness, Exercise, and Stressful Life Events

Variable	r					
	Hardiness Total	CO	CM	CH	Exercise	SLE
Illness Total	-.05	-.06	-.01	-.05	-.04	.28**
Hardiness Total		.78**	.89**	.68*	-.04	-.13**
Control (CO)			.56**	.30**	-.07	-.09
Commitment (CM)				.42**	.01	-.14*
Challenge (CH)					-.05	.05
Stressful Life Events (SLE)						.03

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

CHAPTER 4

Discussion

The present study was conducted to determine whether hardiness and exercise protect health in the presence of stressful life events. Results of the present study indicated the incidence of stressful life events was significantly related to a variety of physical problems. Analysis of variance revealed those high in stressful life events reported a higher number of illnesses on the Seriousness of Illness Rating Scale. Post hoc correlation analysis revealed the magnitude of the stress-illness relationship was .28 indicating participants who experienced a number of stressful events are also experiencing an increase in reported illnesses. This result is consistent with those of previous studies in finding a significant relationship between stress, operationalized by self-reported life events, and changes in health (Banks & Gannon, 1988; Kobasa, Maddi, & Puccetti, 1982; Sarason et al., 1978).

Although the relationship between stressful life events and subsequent illness is significant, the magnitude of the relationship is not particularly pronounced. The correlation indicates the incidence of stressful events, in general, accounts for only about 8% of the variance. Hence, the ability to predict illness is limited by the fact that illness is influenced by a host of unidentified variables. The magnitude of this relationship found in this study was

similar to the stress-illness associations typically found in previous investigations (Kobasa, Maddi, & Puccetti, 1982; Rabkin & Struening, 1976; Roth & Holmes, 1985). These correlations are usually less than .30 (Kobasa, Maddi, & Puccetti, 1982; Roth & Holmes, 1985).

A wide variety of symptoms were reported on the illness checklist. A vast majority of the participants were healthy and reported only mild symptoms. The common cold was the most frequently endorsed problem. Other commonly reported problems included headaches and sore throats. The current investigation is not definitive in supporting a particular direction of causality among stress and illness. The only definitive conclusion that can be drawn from these data is that, in general, stress and changes in health are positively related to one another.

According to Kobasa (1979) and Kobasa, Maddi, and Puccetti (1982), personality hardiness functions as a resistance resource in the encounter with life events. Findings of this study failed to support that either hardiness or exercise promote health by moderating the negative effects of stressful life events. Significant stress-moderator effects have been found in previous research for both hardiness and exercise--findings that are seemingly inconsistent with the present study (Kobasa, 1979; Kobasa, Maddi, Pucceti, 1982; Kobasa et al., 1985; Roth et al, 1989). In considering the hardiness findings, an absence of

significant moderator effects has been reported previously (e.g., Funk & Houston, 1987; Hull et al., 1987; Schmied & Lawler, 1986). Although Kobasa and colleagues have identified a moderator role of hardiness and exercise in previous studies, their work has primarily focused on male participants who are professionals and business executives (Kobasa, Maddi, & Kahn, 1982; Kobasa, Maddi, & Puccetti, 1982). It may be that these effects are apparent in these groups, but not in samples of young adults. This possibility would limit the generalizability of the moderator role of hardiness.

One possible explanation for the lack of stress-moderator findings in regard to exercise involves the subjective self-report ratings of exercise participation. Perhaps exercise participation fluctuates from week to week creating inconsistent information about one's true exercise regime. Eighty-one percent of the participants were categorized as exercisers (active) and 19% represented the no excerciser group (not active). The simplistic classification system used in this study may not be accurately representing the exercise variable and thus, thwarting the ability to detect possible diffrences. Grouping participants into active or non active categories may create a broad range of exercisers that are not truly representative of an exercise population. Future research might use more objective indicators of exercise involvement or an altogether different

measure such as level of fitness. In addition, participants were asked to recall stressful events and illnesses in the past six months. Hence, memory for distant events and its constructive nature may have increased the likelihood of error.

Although not a focus of the study, hardiness and stressful life events were inversely related. Specifically, hardy individuals reported fewer stressful events. Consistent with hardiness theory, hardy persons make optimistic cognitive appraisals that are useful in coping with stressful events (Kobasa, Maddi, Puccetti, 1982; Roth et al, 1989). Thus, these individuals may perceive a situation as less stressful allowing them to cognitively alter their stress levels or hardy individuals may simply experience fewer negative life events.

The present study has several limitations that may be producing insufficient support for the hypotheses. These include exclusive reliance on self-reported measures and the inclusion of a young, healthy, predominantly female sample. Future research in this area should use alternative, more reliable procedures for measuring health such as physicians ratings and health care records. Furthermore, the stressful events that college students experience, though subjectively troubling, may be less severe or chronic than the events older adults encounter. College students also tend to be in better health than older adults (Roth et al., 1989; Wiebe &

MCCallum, 1986). Hence, the results obtained from this study are limited primarily to college students. In addition, the lack of power in the study may explain why only one hypothesis was supported. It cannot be concluded that no effects occurred because the measures may have not detected actual group differences. Further research is needed to ascertain whether specific groups can benefit from developing a hardiness personality. Finally, in order to justifiably generalize hardiness theory to female populations, future research is necessary to examine potential gender differences in response to stress and illness.

REFERENCES

Allred, K. D., & Smith, T. W. (1989). The hardy personality: Cognitive and physiological responses to evaluative threat. Journal of Personality and Social Psychology, 56, 257-266.

Banks, J. K., & Gannon, L. R. (1988). The influence of hardiness on the relationship between stressors and psychosomatic symptomatology. American Journal of Community Psychology, 31, 25-37.

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistcal considerations. Journal of Personality and Social Psychology, 51, 1173-1182.

Bartone, P. T., Ursano, R. J., Wright, K. M., & Ingraham, L. H. (1989). The impact of a military air disaster on the health of assistance workers. Journal of Nervous and Mental Disease, 177, 317-328.

Brown, J. D. (1988). Measuring physical fitness by self report. Unpublished manuscript, Southern Methodist University, Department of Psychology, Dallas, TX.

Brown, J. D. (1991). Staying fit and staying well: Physical fitness as a moderator of life stress. Journal of Personality and Social Psychology, 60, 551-561.

Brown, J. D., & Siegel, J. M. (1988). Exercise as a buffer of life stress: A prospective study of adolescent health. Health Psychology, 7, 341-353.

Cohen, J. (1988). Statistical power analysis (2nd ed.). Hillsdale, NJ: Erlbaum.

Contrada, R. J. (1989). Type A behavior, personality hardiness, and cardiovascular responses to stress. Journal of Personality and Social Psychology, 57, 895-903.

Dishman, R. K. (1994). Prescribing exercise intensity for healthy adults using perceived exertion. Medicine and Science in Sports and Exercise, 26, 1087-1094.

Dohrenwend, B. S., & Dohrenwend, B. P. (1974). Stressful life events: Their nature and effects. New York: Wiley.

Folkins, C. H., & Sime, W. E. (1982). Physical fitness training and mental health. American Psychologist, 36, 373-389.

Funk, S. C. (1992). Hardiness: A review of theory and research. Health Psychology, 11, 335-345.

Funk, S. C., & Houston, B. K. (1987). A critical analysis of the Hardiness Scale's validity and utility. Journal of Personality and Social Psychology, 47, 572-578.

Gentry, W. D., & Kobasa, S. C. O. (1984). Social psychological resources mediating stress-illness relationships in humans. In W. D. Gentry (Ed.), Handbook of behavioral medicine (pp. 87-116). New York: Guilford Press.

Hannah, T. E. (1988). Hardiness and health behavior: The role of health concern as a moderator variable. Behavioral Medicine, 14, 59-63.

Hughes, J. R. (1984). Psychological effects of habitual aerobic exercise: A critical review. Preventive Medicine, 13, 66-78.

Hull, J. G., Van Treuren, R. R., & Virnelli, S. (1987). Hardiness and health: A critique and alternative approach. Journal of Personality and Social Psychology, 53, 518-530.

Jemmott, J. B., & Locke, S. E. (1984). Psychosocial factors, immunologic mediation, and human susceptibility to infectious diseases: How much do we know? Psychological Bulletin, 95, 78-108.

Keller, S., & Seraganian, P. (1984). Physical fitness level and autonomic reactivity to psychosocial stress. Journal of Psychosomatic Research, 28, 279-287.

Kobasa, S. C. (1979). Stressful life events, personality, and health: An inquiry into hardiness. Journal of Personality and Social Psychology, 37, 1-11.

Kobasa, S. C., Maddi, S. R., & Courington, S. (1981). Personality and constitution as mediators in the stress-illness relationship. Journal of Health and Social Behavior, 22, 368-378.

Kobasa, S. C., Maddi, S. R., & Kahn, S. (1982). Hardiness and health: A prospective study. Journal of Personality and Social Psychology, 42, 168-177.

Kobasa, S. C., Maddi, S. R., & Puccetti, M. C. (1982). Personality and exercise as buffers in the stress-illness relationship. Journal of Behavioral Medicine, 5, 391-404.

Kobasa, S. C. O., Maddi, S. R., Puccetti, M. C., & Zola, M. A. (1985). Effectiveness of hardiness, exercise and social support as resources against illness. Journal of Psychosomatic Research, 29, 525-533.

Kobasa, S. C. O., & Puccetti, M. C. (1983). Personality and social resources in stress resistance. Journal of Personality and Social Psychology, 45, 839-850.

LaPierre, A., Antoni, M. H., & Schneiderman, N. (1990). Exercise intervention attenuates emotional distress and natural killer cell decrements following notification of positive serologic status for HIV-1. Biofeedback Self-Regulation, 15, 229-242.

Leon, A. S. (1994). Physical activity levels and coronary heart disease. New England Journal of Medicine, 332, 1312-1317.

Paffenberger, R. J., & Hale, W. E. (1975). Work activity and coronary heart mortality. New England Journal of Medicine, 292, 545.

Pelletier, K. R., & Herzing, D. L. (1988). Psychoneuroimmunology: Toward a mindbody model. Advances, 5, 26-56.

Pelletier, K. R., & Lutz, R. (1989). Mindbody goes to work: A critical review of stress management programs in the workplace. Advances, 6, 28-34.

Rabkin, J. G., & Struening, E. L. (1976). Life events, stress, and illness. Science, 194, 1013-1020.

Rhodewalt, F., & Agustsdottir, S. (1984). On the relationship of hardiness to the type a behavior pattern: Perception of life events versus coping with life events. Journal of Research in Personality, 18, 212-223.

Rhodewalt, F., & Zone, J. B. (1989). Appraisal of life change, depression, and illness in hardy and nonhardy women. Journal of Personality and Social Psychology, 56, 81-88.

Roth, D. L., & Fillingim, R. B.(1988). Assessment of self-reported exercise participation and self-perceived fitness levels. Unpublished manuscript.

Roth, D. L., & Holmes, D. S. (1985). Influence of physical fitness in determining the impact of stressful life events on physical and psychologic health. Psychosomatic Medicine, 47, 164-173.

Roth, D. L., & Holmes, D. S. (1987). Influence of aerobic exercise training and relaxation training on physical and psychologic health following stressful life events. Psychosomatic Medicine, 49, 355-365.

Roth, D. L., Wiebe, D. J., Fillingim, R. B., & Shay, K. A. (1989). Life events, fitness, hardiness, and health: A simultaneous analysis of proposed stress-resistance effects. Journal of Personality and Social Psychology, 57, 136-142.

Sarason, I. G., Johnson, J. H., & Siegel, J. M. (1978). Assessing the impact of life changes: Development of the life experiences survey. Journal of Consulting and Clinical Psychology, 46, 932-946.

Schmied, L. A., & Lawler, L. A. (1986). Hardiness, type A behavior, and the stress-illness relation in working women. Journal of Personality and Social Psychology, 51, 1218-1223.

Shumaker, S. A., & Hill, R. D. (1991). Gender differences in social support and physical health. Health Psychology, 10, 102-111.

Washburn, R. A., & Montoye, H. J. (1986). The assessment of physical activity by questionnaire. American Journal of Epidemiology, 123, 563-576.

Wiebe, D. J. (1991). Hardiness and stress moderation: A test of proposed mechanisms. Journal of Personality and Social Psychology, 60, 89-99.

Wiebe, D. J., & McCallum, D. M. (1986). Health practices and hardiness as mediators in the stress-illness relationship. Health Psychology, 5, 425-438.

Wiebe, D. J., & Williams, P. G. (1992). Hardiness and health: A social psychophysiological perspective on stress and adaptation. Journal of Social and Clinical Psychology, 11, 238-262.

Williams, P. G., Wiebe, D. J., & Smith, T. W. (1992). Coping processes as mediators of the relationship between hardiness and health. Journal of Behavioral Medicine, 15, 237-255.

Wyler, A. R., Masuda, M., & Holmes, T. M. (1968). Seriousness of illness rating scale. Journal of Psychosomatic Research, 11, 363-375.

APPENDIX A

Informed Consent Form

Participation Consent Letter

Please read this consent form carefully. If you have any questions about this project, feel free to ask the researcher and she will answer your questions.

You are invited to participate in a study investigating the effect of hardiness, exercise, and stressful life events on the onset of illness. If you wish to participate in this study, you will be asked to fill out a demographic profile sheet and four questionnaires relating to hardiness personality, exercise participation, number of stressful life experiences, and illness symptoms. It will take approximately one hour to complete the materials.

All information relating to your involvement in this study will be kept strictly confidential. All information will be recorded by code number, and no names or other identifying information will be used.

Your participation in this study is entirely voluntary. In the event that you wish to terminate particiption, you may do so at any time. Termination of participation will have no bearing on your class standing. There is no risk or discomfort involved in completing the study.

If you have any questions or comments about this study, please direct them to the researcher, Maureen Pierce, who may be contacted at (316) 341-5803.

Thank you very much for your time and participation in this study.

- -

I, _____, have read the above information
(please print name)
and have decided to participate. I understand that my participation is voluntary and that I may withdraw at any time without prejudice after signing this form should I choose to discontinue participation in this study.

_____ _____
(signature of participant) (date)

_____
(signature of researcher)

THIS PROJECT HAS BEEN REVIEWED BY THE EMPORIA STATE UNIVERSITY COMMITTEE FOR THE PROTECTION OF HUMAN SUBJECTS.

APPENDIX B

Demographic Form

Demographic Form

Please answer the following questions by placing the appropriate response on the blank in front of the question.

_____1. Gender: 1=Male

2=Female

_____2. Age

_____3. Race:

1=Black

2=White

3=Hispanic

4=Asian

5=American Indian

Other

_____4. Academic Level:

1=Freshman

2=Sophomore

3=Junior

4=Senior

_____5. Marital Status:

1=Single

2=Married

3=Separated

4=Divorced

APPENDIX C

Debriefing Form

Debriefing Form

Thank you for participating in this research. The goal of this research is to examine the effects of hardiness personality, exercise participation, and stressful life events on illness onset.

If you would like to learn more about the results of this research, you can contact me during the summer. At that time, I will be in a position to share any information that I learned in regard to this research. If you would like to learn more about the effects of hardiness, exercise, stress, and illness onset the references below should help you.

If you have any questions at any time about this research, please contact the researcher, Maureen C. Pierce, at 341-5803.

References

Funk, S. C. (1992). Hardiness: A review of theory and research. HealthPsychology, 11, 335-345.

Kobasa, S. C., Maddi, S. R., & Puccetti, M. C. (1982). Personality and exercise as buffers in the stress-illness relationship. Journal of Behavioral Medicine, 5, 391-404.

Rabkin, J. G., & Struening, E. L. (1976). Life events, stress, and illness. Science, 194, 1013-1020.

Appendix D

Instructions for Participation

Instructions for Participation

I am a graduate student working on my Master's in psychology. I am collecting data for my thesis. The research is concerned with personality hardiness, exercise, stressful life events, and illness. First, please read and sign the informed consent that identifies your participation as strictly voluntary. Next, complete the demographics form and the questionnaires packet. Lastly, do not put your names on the questionnaires as they will be scored by an assigned code number. If you have any questions, please ask the researcher. When you are finished, put your questionnaires on the table and pick up a research participation slip to be given to your teacher. Thank you for your participation.

I, Maureen C. Pierce, hereby submit this thesis/report to Emporia State University as partial fulfillment of the requirements for an advanced degree. I agree that the Library of the University may make it available for use in accordance with its regulations governing materials of this type. I further agree that quoting, photocopying, or other reproduction of this document is allowed for private study, scholarship (including teaching) and research purposes of a nonprofit nature. No copying which involves potential financial gain will be allowed without written permission of the author.

Maureen C. Pierce
Signature of Author

July 11, 1996
Date

The Effects of Hardiness, Exercise, and Stressful Life Events on Illness.
Title of Thesis/Research Project

Dan Cooper
Signature of Graduate Office Staff Member

July 23, 1996
Date Received

Distribution: Director, William Allen White Library
Graduate School Office
Author