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ANTICIPATED RELOCATION BY THE AGED:
LIFE CHANGES AND URINARY FREE CORTISOL

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Ann Maxwell Eward

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ANTICIPATED RELOCATION BY THE AGED:
LIFE CHANGES AND URINARY FREE CORTISOL

By

Ann Maxwell Eward

A DISSERTATION

Submitted to
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ABSTRACT

ANTICIPATED RELOCATION BY THE AGED: LIFE CHANGES AND URINARY FREE CORTISOL

By

Ann Maxwell Eward

The purpose of this investigation was to study the stress of anticipated relocation as related to recent life changes and the impact on individuals as measured by urinary free cortisol. This study observed fifteen functionally healthy, active applicants with a mean age of 80 who were anticipating imminent relocation into a retirement village where, within the same building, a supportive care unit and health center could provide continuous care when and if needed. A control group included fifteen persons living independently in the community who were matched for age and other demographic characteristics.

Each participant entered the study as part of a larger, longitudinal investigation in progress. The pre-move assessment included the inventory of life change events and the collection of a twenty-four hour urine specimen for radioimmunoassay.

The number, frequency, and clustering of life change events within the past three years was compared by year for pre-movers and non-movers. The two groups were further divided as to category of low, medium, and high numbers of life change events (LCE). Cortisol excretion rates were observed by group and also between and within LCE group categories.

The major findings of the study follow:

1. The difference in the variance of urinary free cortisol (UFC) excretion rates for pre-movers reporting a high number of life change events over the past three years was statistically significant when compared with non-movers reporting high numbers of LCE. This finding remained significant when compared to pre-movers and non-movers reporting medium or low numbers of LCE.

The observed difference suggests an individual response to a stress threshold which activated the person's defense mechanisms and coping style. However, a larger sample size is advised in studies which attempt to replicate this finding.

2. Major life changes numbered two to three yearly for all persons studied. The loss of social support due to death of spouse, other relatives, and or close friends accounted for approximately one-third of those LCE reported.

3. An observation of physiological covariation of cortisol excretion rates for those couples who evidenced an affective relationship was interesting; however, the number of couples in the study was small with N=5.

4. A reported decline in physical activity was not observed to limit the general interenvironmental mobility of those aged who are capable of independent living.

Recommendations for further study would include a longitudinal study of similar design to repeat observations of life changes, a clinical assessment of health status and coping styles, and the urinary free cortisol excretion rates during and following relocation.

The final recommendation would encourage the development of housing models for the aged that provide accommodating environments to attract the active, vigorous aged, offer a choice of services, and provide alternative care areas within the same architectural structure. This would enable the aged to enhance their social support system while enjoying a degree of functional health, moderate activity and independence, and thereby avoid a relocation during a period of cognitive and physical decline.

This study is presently within the context of a larger, longitudinal investigation. The investigator would caution against premature judgments related to the stress of relocation based solely on the pre-move data.

DEDICATION

To my grandmother
Nealie Nettles Stallworth
born in 1882
a kind and gentle person

ACKNOWLEDGEMENTS

This effort was made possible through the love, support, encouragement, and professional guidance of many people. It is a reminder that no persons ultimately achieve in and of themselves, and that the ability to initiate and sustain meaningful relationships is a tribute to all of us who dare to venture.

I, therefore, wish to pay tribute to the following people who contributed foremost as professionals and became good friends, and who are intimately responsible for this achievement with the author.

In alphabetical order, and with a deep sense of gratitude, I thank you

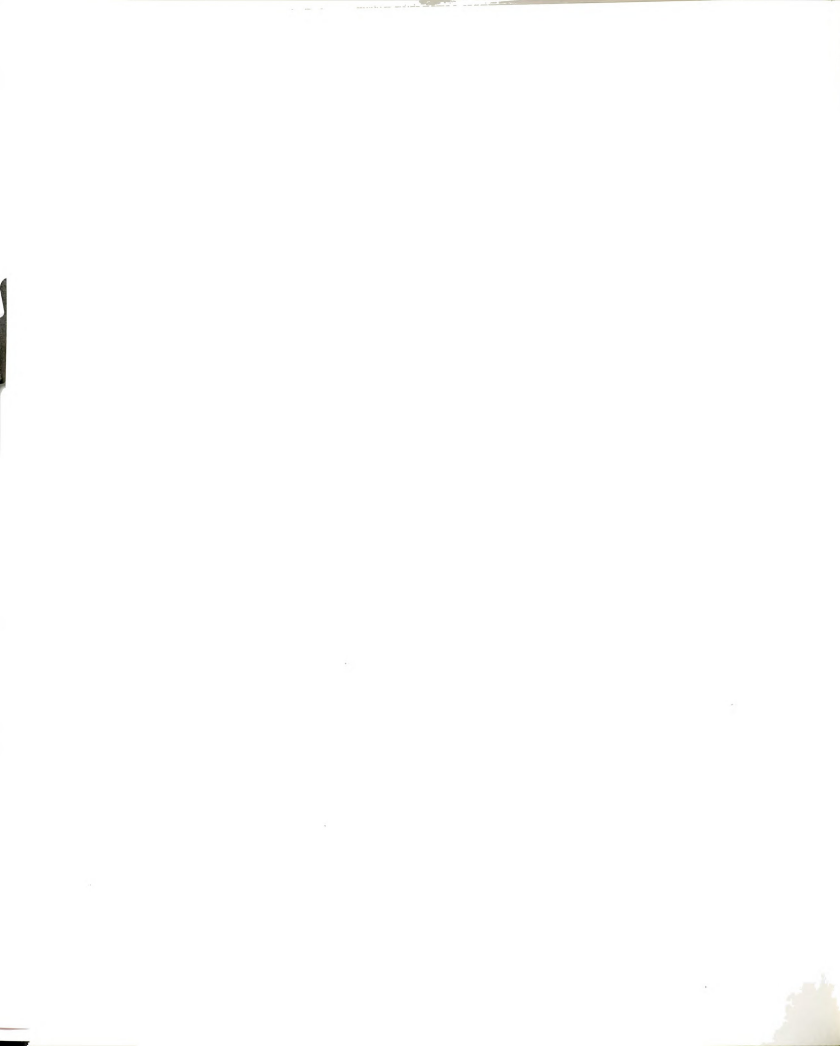
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TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS	ii
LIST OF TABLES.	v
LIST OF FIGURES	vi
 Chapter	
I. STATEMENT OF PROBLEM	1
Overview of Chapter I	1
Statement of the Problem	1
Purpose of this Research	3
Significance of this Research	7
Research Questions and Hypotheses	8
Definition of Important Terms	9
Summary.	10
Overview of Other Chapters in Study	10
II. REVIEW OF RELATED LITERATURE	12
Overview	12
Relocation as Related to Physical Decline and Illness	12
Stress and Adrenocortical Response	18
Life Change Events as Related to Illness and Physical Decline	25
III. RESEARCH DESIGN AND PROCEDURES	29
Design	29
Design Over Time.	29
Experimental Treatment.	30
Subjects	31
Instrumentation	34
Validity Concerns	37
Design Over Variables	41
Research Hypotheses.	44
Procedures	45
IV. ANALYSIS OF RESULTS	53
Findings	53
Interpretation of Findings	70



Chapter	Page
V. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS	80
Summary and Conclusions	80
Recommendations	87
REFERENCES	91
APPENDICES	98
Appendix A: Life Change Events Inventory	99
Appendix B: Life Change Events As Factored	103
Appendix C: Hypothalamo-Pituitary-Adrenocortical Axis Review.	104
Appendix D: Life Change and Illness Model	106
Appendix E: Grant Proposal: Decline of the Aged Related to Stress of Relocation (Abstract)	109

LIST OF TABLES

Table		Page
1	Demographic Characteristics	33
2	Religious Preference.	47
3	Frequency Categories of LCE	54
4	Frequency Distribution of LCE Categories for Movers and Non-movers	55
5	Number of LCE for Movers and Non-movers by Year. .	55
6	Number of LCE by Year for Movers and Non-movers, Christmas Excluded	56
7	Number of LCE for Movers and Non-movers by Factors of Social Support, Life Style, Events, and Relocation	57
8	Comparison of Loss by Death Within the Past Three Years for Movers and Non-movers	58
9	Comparison of Social Support and Life Style Factors by Year for Movers and Non-movers	59
10	Significant Life Style Changes	60
11	Personal Injury or Illness by Year by Group . . .	60
12	Significant Events by Group	61
13	Decision to Move by Year	62
14	χ^2 of Decision Year by Frequency of LCE	62
15	UFC Excretion Rate by Group	64
16	Frequency Distribution of UFC for Total Sample . .	65
17	Comparison of UFC Values by Group and LCE Frequency Category	67
18	ANOVA for UFC and LCE	68
19	Variance of UFC by LCE Category	68
20	UFC Summary Data of LCE Frequency Category by Group	68
21	Comparison of UFC Mean Difference in Married Couples by Relationship	69



LIST OF FIGURES

Figure	Page
3.1 Design Over Time	30
3.2 Life Change Events Variable Matrix	42
3.3 Urinary Free Cortisol Variable Matrix	42
3.4 Urinary Free Cortisol by Life Change Events Variable Matrix	43

CHAPTER I

STATEMENT OF PROBLEM

OVERVIEW OF CHAPTER I

The first topic, STATEMENT OF THE PROBLEM, indicates that relocation of the aged is a major life change, a presumed stressor, and is often associated with physical decline and mortality. Next, the PURPOSE OF THIS RESEARCH is to study the stress of anticipated relocation as related to recent life changes and the impact on the limbic system as measured by urinary free cortisol excretion rates.

The third topic, SIGNIFICANCE OF THIS RESEARCH, is to provide anticipatory, pre-move data to demonstrate the relationship of life changes and cortisol secretion to the stress of imminent relocation. These data are part of an initial observation in a longitudinal study of individual responses to the stress of relocation over time.

The sections of RESEARCH QUESTIONS AND HYPOTHESES and DEFINITION OF IMPORTANT TERMS follow. A SUMMARY of chapter I concludes with an OVERVIEW OF OTHER CHAPTERS IN STUDY.

STATEMENT OF THE PROBLEM

Relocation stress is a real problem associated with the aged and for which there is good evidence of its phenomenal existence and its dire consequences to physical health. The aged appear to respond to the potential stress of relocation in a manner that is complex,

heterogeneous, and unpredictable. Evidence indicates that the aged respond in a highly individual manner to changes in their environment and that a dramatic increase in death rate may occur in seemingly low-risk populations following relocation.

Initially, interest in the study of relocation of elderly persons was spurred by reports of statistically significant increases in mortality and morbidity rates three months prior to three months following a relocation. Subsequent studies have suggested that relocation results in higher mortality and morbidity rates for some older persons but lower mortality and morbidity rates for others. During the past decade, studies have challenged purported predictors of high risk in areas concerning certain demographic variables, health status measures, voluntary versus involuntary relocation, and the mediation effects of relocation programs and social services. Disagreement exists as to which measures are the most replicable as indicators specific to healthful adjustment and which are significant indices of failure to thrive. Frequently concluded from such studies is the expressed, persistent need for an interdisciplinary, longitudinal approach in studying the problem.

The decline of functionally healthy persons who have been relocated was initially reported by Aldrich and Mendkoff (1963), Blenkner (1967), and Lawton and Cohen (1975).

Kiritz and Moos (1974) have reported considerable evidence showing that individuals experiencing change in their environment undergo physical changes and are more susceptible to disease. They further state that a feeling of relatedness and environmental support

within one's environment tend to "homogenize" the values of cortisol and positively affect the person-environment fit.

In addition, a large body of evidence demonstrates an association between stressful life events and both psychological and physical illness. The most striking findings according to Miller, Ingham, and Davidson (1976) appear to be the highly significant correlations between threatening events and psychological symptoms. It is postulated that when life events are linked to physical ailments, the exacerbation is initiated by psychological symptoms, i.e. anxiety, depression. For an event to cause ill effects, a stress threshold must be exceeded. Findings suggest that events which fall above this threshold are probably additive -- and the more events there are, the worse the psychological symptoms.

PURPOSE OF THE RESEARCH

The preceding section has illustrated the need for an objective indicator in assessing the individual differences in response to the stress of relocation.

Psychological influences are among the most potent natural stimuli known to affect pituitary-adrenal cortical activity. Marked individual differences in pituitary-adrenal cortical response to any given situation have been a striking and consistent feature of psychoendocrine studies.

The emotional response to a situation both colors the experience and initiates attendant physiological responses within the person's autonomic, psychoendocrine, and neuromuscular apparatus. It



is difficult to distinguish the operation of an individual's perceptions of a situation from the defenses or coping strategies. A number of studies have illustrated the interaction of personality and environmental variables without differentiating between perceptual and coping factors. The measurement of physiological responses which are mediated by difference in perception, coping and defense might enable us to make environments healthier in general or improve person-environment fit for specific groups of individuals.

Reliance has been placed upon situational criteria of stress with a relative lack of systematic evaluation of the important and often marked individual differences between subjects and their emotional defensive reactions to a given situation. It has been repeatedly shown with human subjects that there are wide individual differences in psychoendocrine responses to the same situation or stimuli. No matter how seemingly threatening or drastic the life situation or stimulus, it cannot be assumed that all, or even most, subjects will experience substantial emotional arousal or distress.

Psychoendocrine measurements such as the cortisol assays provide the behavioral scientist with a sensitive, objective index of physiological reflection of emotional state that represents a balance between forces promoting affective arousal or distress versus those of a protective or defensive nature which prevent, minimize, or counteract arousal or distress.

While the dissemination of psychoendocrine data has remained largely within the psychiatric literature, the profound and practical implications for the study and understanding of physiological integration

(functions) is a viable challenge to interdisciplinary scientists. As the endocrine glands are regulated in life by both physical and psychological stimuli, the psychoendocrinologist is perhaps in as much danger of ignoring physical or constitutional factors as the physiologist is of ignoring psychological factors in the conceptualization of endocrine regulation in experimental study.

In this study, a physiological measure is being recorded and analyzed for its psychological significance, with recognition that the physiological system being monitored is subserving a primary physiological function.

A fundamental distinction between the physiological and psychological correlates of a physiological measure is in terms of the relevancy or irrelevancy of the physiological change to the direct needs of the body. Because the system is subserving, the use of physiological measures in a psychological context is limited; however, with adequate precautions and the careful choice of measure, these physiological considerations can be minimized so that valid data with reliable psychological implications can be obtained.

With the development of accurate biochemical methods for the measurement of corticosteroid levels in blood and urine, it has been established that there exists an important relationship between psychological function and the adrenocortical activity as evidenced in the earlier studies by Wolff et al. (1964), Mason (1968), and Friedman et al. (1963). Plasma and urinary corticosteroid levels as a function of psychological or physical stress have been of particular interest to numerous investigators currently; among these are George Curtis, M.D. (1972, 1976, 1977).

Measuring the relationship between stress and the activation of the adrenal cortex has been greatly facilitated by the radioimmunoassay approach which demands less broad biochemical training and thus merits consideration by the psycho-social scientist. Using the cortisol assay in a recent study, Tennes, Downey and Vernadakis (1976) found that the ratings of separation anxiety and levels of urinary cortisol after the imposed stress were positively correlated.

Urinary free cortisol has been used as an indication of adrenocortical function for many years and is used in the human factors research to relate corticosteroid excretion to human performance as reported by Miller et al. (1970). The specificity of determination of urinary free cortisol increased with the advent of the competitive protein binding assays and has increased even more with radioimmunoassay. The radioimmunoassay method for urinary free cortisol provides a very sensitive index of adrenocortical function and is simple, rapid and reproducible as indicated by Sokoloff and Hilderbrand (1977) and by Borsi et al. (1976). The procedure has been applied to over 1,000 urine specimens as part of an ongoing program to correlated biochemical constituent values and occupation stress and performance levels among Naval personnel as reported by Miller et al. (1970).

In summary, the primary purpose of this research is to study the stress of relocation as related to recent life changes and the impact on the person as mediated through the hypothalamo-pituitary-adrenocortical axis. (Appendix C). This study is presently within the context of a larger, longitudinal investigation in progress. (Appendix E).

SIGNIFICANCE OF THIS RESEARCH

The significance of this research is that the assay of the urinary free cortisol prior to relocation will provide a measure of adrenocortical activity as a dependent variable which may then be observed in repeated measures in a longitudinal study to include observations during and following relocation.

The schedule of life change events will provide an added measure for clarifying and interpreting the findings as associated with the objectification of the cortisol measure.

The longitudinal study is calculated to give good evidence of relocation stress by demonstrating the relationship between emotional stress and augmented cortisol secretion and production rates which may be predictive of physical decline. The expected rate of success is high given the objectification of a cortisol measure within the relationship dimension of the person-environment fit.

This relationship dimension is conceptualized within a relocation time frame which begins prior to the move. This study of the anticipatory phase, Anticipation of Imminent Relocation, observes the dynamics within the following triad:

1. perceived imminent loss of a familiar environment and the anticipated demands for coping with a new environment
2. accrued number of life change events over time
3. relationship to cortisol excretion.

The following research questions and hypotheses are of primary interest during the anticipatory phase of relocation.

RESEARCH QUESTIONS AND HYPOTHESES

RESEARCH QUESTIONS

1. Is there an association between an increased number of life change events and the anticipation of imminent relocation?
2. Is there a relationship between the anticipation of imminent relocation and urinary free cortisol excretion?

The first question addresses the concept of the "crescendo" or clustering effect and is to determine if relocation is associated with other major life changes. The second question addresses the noted stability of the adrenocortical measure and is to determine if the anticipation of imminent relocation, apart from other major life change events, causes a change in adrenocortical activity.

RESEARCH HYPOTHESES

1. There is no difference in the number of Life Change Events between persons who Anticipate Imminent Relocation and those who do not.
2. There is no difference in urinary free cortisol values between persons who Anticipate Imminent Relocation and those who do not.
3. There is no difference in Urinary Free Cortisol Values between persons who have high, medium, and low numbers of Life Change Events.

DEFINITION OF IMPORTANT TERMS

Definitions for the key terms used in the study follow to provide a common basis for understanding.

1. Anticipation of Imminent Relocation - Approved applicants are notified that relocation may be expected within eight months. Observations were made when the applicant anticipated that the move would occur within six weeks.
2. Relocation Time Frame - Relocation is conceptualized within a longitudinal time frame with four phases, e.g. (1) the anticipatory phase, (2) the actual move and "novelty" phase, (3) the short-term adjustment, and (4) long-term adjustment. This study examines the first phase, Anticipation of Imminent Relocation.
3. Urinary Free Cortisol Excretion - This is a quantitative measurement of free cortisol within the urine and is indicative of adrenocortical activity. Quantification is determined by radioimmunoassay and may be referenced in the laboratory as cortisol production rates.
4. Life Change Events - The Holmes and Rahe Scale contains forty-three items which include relocation as "change in residence." (Appendix A). These events usually require some adaptive or coping behavior on the part of the involved individual and represent positive as well as negative items on the inventory. The Holmes and Rahe (1967) list of forty-three events was based on the "social readjustment ratings" empirically found to be associated with illness onset.

SUMMARY

In summary, Chapter I presented the problem of the decline and disability which is often associated with relocation of the aged. Since relocation has been identified as a major life change event, the study sought to determine the number, frequency, and clustering of other life change events within the three-year period prior to the anticipation of a move. A change in cortisol production and excretion rates has been observed in studies where people are involved in various life change events; however, no study to date has compared cortisol values and other life change events within a relocation time frame. Since cortisol changes may be predictive of coping or defense mechanisms, a pre-move assessment may provide valuable information for predicting post-move adjustment as related to health.

The significance of this study is to establish basal cortisol values for each participant as a comparison across time for repeated measures in another experimental context. The research questions and hypotheses were generated from studies by other investigators whose works are cited in Chapter II entitled, Review of Related Literature.

OVERVIEW OF OTHER CHAPTERS IN THIS STUDY

Chapter II provides a REVIEW OF THE RELATED LITERATURE pertinent to three major areas of concern, (1) Relocation of the Aged and Related Physical Decline and Illness, (2) Stress and Adrenocortical

Response, and (3) Life Change Events as Related to Illness and Physical Decline. Chapter III details the RESEARCH DESIGN AND PROCEDURES, and Chapter IV states the ANALYSIS OF RESULTS. Finally, Chapter V contains the SUMMARY, CONCLUSIONS, DISCUSSION AND RECOMMENDATIONS.



CHAPTER II

REVIEW OF RELATED LITERATURE

OVERVIEW OF CHAPTER II

The review of related literature is divided into three main areas: (1) Relocation as Related to Physical Decline and Illness, (2) Stress and Adrenocortical Response, and (3) Life Change Events as Related to Illness and Physical Decline. The parameters of each area presented in the review of literature are interrelated.

RELOCATION AS RELATED TO PHYSICAL DECLINE AND ILLNESS

Investigators have reported that elderly patients often become seriously ill, sometimes fatally, when they are moved from a familiar environment. Studies of how the external environment affects people undergoing relocation and those measures of health, personality, life style, emotional stability and perception of the move have as yet failed to yield baseline data needed to identify those people placed in special jeopardy by relocation. Consequently, there is little information about how older people should be prepared for a move and what the effects of preparation are in facilitating adjustment to a new setting. The anticipation of relocation and the disorganization during and immediately after a move are associated with physical decline in certain elderly people.



In a series of published reports, (Relocation Reports, 1971, 1976), the Institute of Gerontology in Ann Arbor disclosed their findings concerning the decision of the Washtenaw County Board of Commissioners to close the old county home in the spring of 1971. The transfer of most of the population of elderly patients to the Whitmore Lake Convalescent Center, a new private facility about 15 miles away, was expected to cause sharp disruption in the patients' lives. The move would be from an old building and a familiar environment to a very modern and unfamiliar milieu. A relocation preparation program was presented in three phases. Phase I permitted all patients who were medically able to be taken to the new convalescent center and given a tour of the facility. Phase II involved dividing the group in half. The first group visited the new setting three more times. The second group remained at the county home and was acquainted with the convalescent center through slides and pictures. Discussion groups for both Group I and Group II were similar in content and structure. Phase III was the move itself. County facility staff escorted all patients to the new facility on moving day. The results of the program indicated that the multi-visit preparation program had a dramatic effect on the patient mortality rate. Within one year of the move, more than half of Group II (single visit) had died (52%). The mortality rate for the group making four visits was 27 percent. The groups were closely matched on age, sex, degree of illness, physical limitation, mental status, and level of behavior. Overall, the patients from the Washtenaw County Medical Care Facility (WCMCF) died at a much higher rate during the year of relocation than during the



previous five years at the same institution. A total of 34 percent of the 61 patients at WCMCF died during the six months before and six months following the move to the Whitmore Lake Convalescent Center. The average annual death rate during the five years before the move at WCMCF was 21 percent. During the year of the move, the relocated WCMCF patients died at a rate three times that of the matched control patients at the Sandusky County Home in Fremont, Ohio who were not relocated. However, during the three months before the move, the death rate for the relocated WCMCF group was six times greater than the rate for the stable Sandusky County Home group. The rate was about eight times higher during the three months immediately after the move. For a comparison, this study cited statistics from the National Center for Health which showed a mortality rate of 27.5 percent for the 1974 Nursing Home Population of the United States.

The findings from the Pennsylvania Nursing Home Relocation Program (1976) suggest that the strongest predictor of mortality among the Relocation Program population is age, followed closely by prognosis and mental status at the time of relocation. Other factors associated with mortality are distance moved, and pre- and post-move attitude. Correlated with these three predictors, advanced age, poor prognosis, and confused mental status, are other variables such as incontinence and limited activity. These studies further indicate that patients with a neutral pre-move attitude died at a higher rate than those who were either accepting or rejecting. Or it may be a reflection of the



very old sick and/or confused person's inability to express a clear reaction to an anticipated event. In contrast, post-move mortality was 41 percent of those rejecting and 14 percent among those who accepted relocation.

Gutman and Herbert (1976) compare the mortality rate of ambulatory and non-ambulatory patients in an involuntary relocation of the entire population of the male extended care ward at Vancouver General Hospital. Of the 24 ambulatory patients, 50 percent died within the twelve months follow-up period. The mortality rate for non-ambulatory patients was only 26.31 percent. A similar trend was observed at 21 months with a 66.66 percent mortality among ambulatory and 43.63 percent among the non-ambulatory patients. In the five control groups, death rates were higher among non-ambulatory than among the ambulatory patients. This finding is in contrast to the results obtained by Killian (1970) who reported excessive mortality rates among non-ambulatory patients but diminished mortality among ambulatory patients.

In a study by Rodstein, Savitsky, and Starkman (1976) of 100 elderly persons consecutively admitted to the Jewish Home and Hospital for the Aged, the majority of significant medical changes which occurred in the first month after admission were cardiovascular. Patients with pre-existent cardiac disease and low circulatory reserve are easily thrown into a state of acute coronary insufficiency, acute cardiac failure or acute cardiac arrhythmia by a variety of physical and emotional stresses. Previous studies have supported the concept that life stresses play a significant role in precipitating cardiac and other illnesses. Zohman (1973) related the development of overt



coronary artery disease in the aged to such stresses as change to more restricted living quarters, absence of privacy in living quarters, neglect of visiting by relatives, loneliness, and serious conflicts with housemates such as non-relatives or neighbors.

Zweig and Csank (1976) have presented an exceedingly interesting study of the effects of mass transfer of disabled veterans in a chronic disease unit at Ste. Anne's Hospital, Canada, to a new building. A transfer-stress-prevention program was introduced one year prior to the actual move in an effort to counter the untoward effects of relocation. That year had the highest absolute mortality count with the lowest population at risk of all years studied. At worst, it should not have been much different from the two years which preceded it. An additional irony is that the move itself was followed by a decline in mortality. Anxiety is basically anticipatory and may account for the paradoxical results of the stress-prevention relocation program and subsequent move. Since anxiety can be inhibited and then displaced after a period of time, it may well be that one of the crucial periods is not in the months that follow relocation but some time later. Further studies by Zweig and Csank give support to the observation that a high-risk period may occur some time after relocation.

In contrast to the lengthy preparation period cited above, Watson and Buerkle (1976) describe an involuntary relocation of geriatric patients at the Veterans Administration Hospital, St. Cloud, Minnesota. One week prior to reorganization, patients were told briefly about the impending transfer. No formal orientation was given.

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Approximately one-fifth of the patients on a ward were transferred one morning to wards whose architecture, furniture, staff attitudes, and daily routine varied little from those of their previous setting. Many continued the same Rehabilitative Medicine Program to which they had become accustomed. A post reorganization comparison between relocates and those in two comparison groups actually indicated a slight morbidity/mortality advantage but not one of statistical significance. These findings indicate that involuntary transfer can be accomplished without serious traumatic effects on physical health and should be viewed as an attempt to delineate the limits within which the relocation hypothesis operates.

Aldrich and Mendkoff (1963) indicate that when disabled persons, especially the elderly, are transferred from one institution to another for reasons which have nothing to do with their health or their family's attitude, there is a marked increase in the death rate, and particularly within the first three months following relocation. For patients whose pre-relocation behavior pattern was neurotic, depressed, or compulsive, or who denied their physical disabilities, the death rate was three times higher than for patients with a satisfactory adjustment and more than twice as high as that for patients whose adjustment was characterized by hostility and demanding behavior. For those patients demonstrating a philosophical or overtly angry response to the news of relocation, the mortality rate was especially low and for those showing an anxiety response, the rate was lower than average. The mortality rates for depressed patients and particularly for the small group who denied the reality of the impending relocation, were much higher than average.

STRESS AND ADRENOCORTICAL RESPONSE

In 1936, Hans Selye demonstrated that the pituitary-adrenocortical axis which influences many metabolic functions responded to "mere emotional stimuli" in rats. Studies in neuroendocrinology and the behavioral sciences (Harris, 1956) demonstrated the functional significance of the hypothalamo-hypophyseal portal capillary system as a neuro-hormonal link between the hypothalamus and the anterior pituitary gland. These hormonal responses are viewed as reflecting intrapsychic processes for a relatively objective approach to quantitative and qualitative study of psychological mechanisms operating in response to stress. It is of some import to note that stress is a collective term for an area of study. Lazarus (1966) indicates that "stress" as a generic term for a complex phenomenon includes the stimuli producing stress reactions, the reactions themselves, and the various intervening processes. Therefore, the parameters of the field of stress include the systemic or physiological which is concerned primarily with the disturbances of tissue systems, (e.g. Cannon, 1929; Selye, 1956); the physiological stress with cognitive factors leading to the evaluation of threat (Lazarus, 1966); and social stress with the disruption of a social unit or system (Smelser, 1963). It is within this collective context that we have operationalized a study of stress and relocation. (Appendix D).

The study of stress was facilitated by a major breakthrough in hormone assay methodology in 1952 with the chromatographic Nelson-Samuel's method for determining 17-OHCS levels in plasma, and more



recently, radioimmunoassay (RIA) procedure. Dr. Rosalyn Yalow and Dr. Solomon Berson have been credited with the development of the sensitive radioimmunoassay procedure which increased the specificity of determination of urinary free cortisol. Further study of interassay and intra-assay variabilities by Sokoloff and Hilderbrand (1977) has demonstrated a high specificity and reliability in the RIA method for determining urinary free cortisol.

Since the pituitary-adrenocortical system is known to be altered by psychosocial stimulation, it is the focus of considerable attention because of evidence primarily derived from pharmacological studies. Studies which seek to correlate stress reactions associated with relocation and concomitant illness and physical decline are of interest to researchers from diverse disciplines.

In a series of investigations begun some years ago, Kral, Grad, and Berenson (1968) did a follow-up study on the stress reactions resulting from the relocation of an aged population from the Gerontologic Unit of the Allan Memorial Institute of Psychiatry, McGill University and the Maimonides Hospital and Home for the Aged, Montreal. The subjects were categorized as normal male (NM), normal female (NF), psychotic male (PM), and psychotic female (PF). The study concludes that more psychotic subjects died than did those termed as normal; however, some interesting morbidity statistics seem to correlate with findings in the plasma corticoids which were measured before and after relocation. Following relocation the normal men responded with an increase in plasma cortisol (PC) from 14.1 to 17.4 mcg percent, while the normal females showed a decrease at the same time from 15.5 to

14.3 mcg percent. The difference in response was statistically significant. There was no significant difference in the PC level between men and women before relocation. Twenty-five percent of the men died within six months of relocation and none of the females died. When subjects were compared according to symptomatology, 18 out of 54 subjects (33%) had no complaints, 23 (43%) had symptoms without organic signs and 13 (24%) had organic signs.

The complaints of the 23 subjects without organic signs involved vertigo with falls, insomnia, backache, complaints relating to the anal region and to the passage of urine; however, 41 percent related to the abdominal area. Of the 13 subjects with organic symptoms, six had respiratory tract related infections. Four presented cardiovascular signs, one developed a stroke, another had intraventricular conduction defect, and two had myocardial infarcts. Three had symptoms referable to the eye and two of these belonged with the respiratory group. Two subjects developed dermatitis. Eleven of the thirteen subjects developed organic signs within four months of relocation and of these, six developed them between two to four weeks after relocation.

Examination of the data indicates that the normal men who presented organic signs showed a greater increase in the plasma cortisol levels than those who presented complaints without organic signs. The mean PC levels of the latter were in turn higher than for those NM who made no complaints regarding their health. Analysis of NC (no complaint) subjects was statistically significant in men only. The four deaths within the first six months occurred only in men (NM), and the death rate within 23 months of relocation was 42 percent for male and 20 percent

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1904

1905

for female subjects. Interestingly, the appearance of organic symptoms and complaints without symptoms occurred at least two weeks after the increase in plasma cortisol. Inasmuch as the greatest plasma cortisol change was observed in those subjects with the severest symptoms, this suggests that the plasma cortisol response to a stress or change may be a prognostic indicator of who will fall ill subsequently, as well as to what degree of illness may develop.

Kiritz and Moos (1974) have concurred that there is considerable evidence that individuals experiencing change in their environment undergo physiological changes and are more susceptible to disease. In his review paper in 1968, Mason implicates change and novelty as influences leading to elevation in the 17-hydroxycorticosteroid level. Mason further suggests that while it was generally assumed 15 years ago that adrenal cortical responses in any given stressful situation were caused by "physical" factors unless proved otherwise, it now appears increasingly important to take the position that concomitant emotional stimuli must be ruled out before it can be concluded that a "physical" stimulus is capable, in itself, of eliciting increased adrenal cortical activity, as Selye's "stress" concepts suggest. It has been repeatedly shown with human subjects that there are wide individual differences in psychoendocrine response to the same situation or stimulus. No matter, suggests Mason, how seemingly threatening or drastic the life situation or stimulus, it cannot be assumed that all, or even most, subjects will experience substantial emotional arousal or distress.

There is interesting data concerning the physiological correlates of one individual's involvement with another person, or his involvement in a task or situation (Insel and Moos, 1974).

Kaplan, Burch, and Bloom (1964) suggest that positive or negative involvement with others in one's psychosocial environment promotes physiological covariation. Other findings (Insel and Moos, 1974) support the conclusion that affiliation and not simply exposure to common environmental stimuli is responsible for physiological covariation. Furthermore, Kiritz and Moos state that closely related to affiliation and cohesion is the notion of involvement in one's social environment. Involvement implies a strong affective relationship towards the members and goals of the environment in which one is participating. Clearly some environments are more involving for most of their members than other environments.

Mason and Brady (1964) believe that pituitary-adrenal cortical activity can be seen, in part, as a general index of interaction or involvement of the animal with the physical and social environment. They present evidence that the mere presence of others with whom to interact leads to increases in 17-OHCS excretion. In one experiment, rhesus monkeys were housed in individual cages in the same room. When the cages were removed to separate rooms, 17-OHCS excretion dropped. In another study, a hospitalized patient experienced a drop in 17-OHCS excretion every weekend, when he was transferred from a bustling surgical ward to a quiet hospital across the street.

In his extensive review of psychoendocrine research, Mason concluded, in part, that elevation of 17-OHCS level is not related to



a highly specific affective state such as stress or anxiety, but "appears to reflect a relatively undifferentiated state of emotional arousal or involvement, perhaps in anticipation of activity or coping."

It is particularly necessary, in the case of the dimension of involvement, to consider the interaction of personal environmental variables. This is exemplified in a study by Friedman, Mason and Hamburg (1963) who measured the 17-OHCS secretion of parents of children hospitalized with leukemia and found that the steroid levels of the 43 subjects tended to remain within a relatively restricted range, even when the parents were exposed to severe acute stresses associated with the illnesses of their children. However, the subjects' rankings of mean daily 17-OHCS excretions were related to how emotionally vulnerable they were to their children's plight, as judged by the experimenters. The most vulnerable parents exhibited the most extreme elevations of 17-OHCS. Those parents who were judged to use denial defenses had the lowest 17-OHCS levels. These parents were, in a sense insulated by their psychological defenses from involvement in the social environment which included their fatally ill children. Thus, even extreme environmental press for involvement can be countermanded, at least temporarily, by the individual's defenses and other stable personality mechanisms.

It is often difficult or impossible to distinguish the operation of an individual's perceptions of a situation from the use of defenses or coping strategies. However, a number of studies illustrate the interaction of personality and environmental variables without attempting to differentiate perceptual from coping factors. Katz,

Weiner, Gallagher, and Hellman (1970) assayed 17-OHCS in 30 women hospitalized with breast tumors, several days before biopsy was to be performed, to determine if the patients had breast cancer. The subjects showed a broad range of values of 17-OHCS secretion, none of them remarkably high. In addition, the subjects were extensively interviewed to determine their patterns of coping and adequacy of ego defenses. The three measures of adequacy of defenses were significantly correlated with 17-OHCS secretion; those with least effective defenses showed the greatest 17-OHCS. Patients who used one of the three defensive patterns labeled "stoicism-fatalism," "prayer and faith," and "denial with rationalization" experienced considerably less disruption, as judged by the steroid hormone secretion rates and the psychiatric rating scores. Summarizing much of this literature, Mason points out that too much reliance has been placed upon situational criteria of stress and upon mean group values, with a relative lack of systematic evaluation of the important and often marked individual differences between subjects in their emotional defensive reactions to a given situation.

We have noted empirical studies of cortisol levels as an indicator of perceived stress associated with a change in the person's physical and/or social environment. A study by Volicer (1978) which commented on Mason's observation that "newly admitted subjects exhibited increased urinary corticosteroid levels, decreasing to normal levels during the first week of hospitalization," has found that actual physical changes believed to be indicative of stress can be observed shortly before or at the time of hospitalization. This study further

observed that increased life stress prior to hospitalization is associated with high pain scores for medical patients and low physical status scores for surgical patients and less improvement after discharge with a lower degree of return to usual activities than for those who scored low in hospital stress.

LIFE CHANGE EVENTS AS RELATED TO ILLNESS AND PHYSICAL DECLINE

Life change events are generally temporal in their occurrence and take place over a relatively brief span of an individual's total lifetime; however, the duration of psychological and physiological effects of a person's recent life changes appears to vary from a few weeks to a year or more. Various studies have associated life change events with the onset of such diverse medical entities as tuberculosis, diabetes, mental illnesses, coronary heart disease, various neoplastic diseases, and the gamut of minor complaints. These life change events have included personal, family, marital, occupational, recreational, economic, social, interpersonal, and religious changes in the psychosocial environment. In studying the effects of specific life changes on illness susceptibility, Syme, Borhani, and Buechley (1965) found that subjects with a history of residential and/or job mobility have significantly higher prevalence rates for coronary heart disease than do persons who are less mobile. The significance of psychosocial stress factors in the etiology of cardiovascular disease has also been reported by Theorell and Rahe (1971) in an analysis of data collected by Stewart Wolf which provides evidence of the importance of stressful recent life changes as related to coronary death.



The relationship of certain life events on man's well being was noted by Farr (1837) who observed that imprisonment resulted in higher mortality rates of inmates. Early in this century, Sigmund Freud, along with colleagues such as Alfred Adler, outlined concepts of early life stress and illness susceptibility, including the notion of illness specificity. Walter B. Cannon (1929) and later Hans Selye (1956) clearly demonstrated physiological phenomenon associated with emotional stress in animals. Franz Alexander (1966), Adolf Meyer (1951), Stanley Cobb (1976), Harold Wolff (1953), Steward Wolf (1970), and George Engle (1955) contributed to major studies and life stress and illness in human subjects. A shift in methodological emphasis from subjective testimonies of the effects of life stress to more objective analyses of the life stresses themselves was apparent in the early 1950's. Meyer (1951) generated a biographical method for demonstrating the relationship of biological, psychological, and sociological phenomena of processes of health and disease in man. Subsequent research efforts by Wolff, and Wolf, and Hare (1958) suggested that stressful life events evoked psychophysiological reactions and were casually implicated in many diseases.

Rahe (1968) used a weighted scale of life change units based on changes in health, work, home, family, personal and social activity as a predictor of illness. Evidence strengthens the inference that change rather than undesirability is the characteristic of life events that should be measured for their effects such as serious psychological and organic diseases as well as for relatively mild psychological symptoms. Many of the life events denoted by Meyers (1951) are found in the 43 life events inventory by Holmes and Rahe (1967).



Nuckolls, Cassell, and Kaplan (1972) have studied life change events for expectant mothers and found that more complications of pregnancy and parturition occurred in the expectant mothers who experienced higher levels of life changes. Paykel et al. (1975) published a study which found that life change events occurring within the past six months were nearly twice the level for patients admitted to the hospital for depression compared to a healthy matched control group. For those patients who attempted suicide, the level of recent life change events was four times that of the controls.

Theorell (1971), Rahe (1971, 1973, 1974), and colleagues in Sweden have demonstrated a significant life change buildup six months prior to myocardial infarction, and a three times greater level of recent life change events for patients who died suddenly from heart disease. In other studies by Madison and Viola (1968), as well as Parkes (1971), it was found that widows and widowers developed significantly more illness during the six months to one year immediately following the death of their spouse than did matched controls.

Thus, the findings of a number of different researchers using diverse recent life change and near-future illness methodologies have shown similar findings. However, most studies provide only mean life changes and illness data, applicable to the group as a whole; individual variability in life change buildup and disease onset was often not examined.

Studies by Miller, Ingham, and Davidson (1976) found a high correlation between threatening events and psychological symptoms,



especially anxiety. They postulated that when life events are linked to physical ailments the exacerbation is initiated by psychological symptoms such as anxiety or depression. These investigators failed to observe an association between symptomatology and non-threatening events. However, Dohrenwend and Dohrenwend (1974) found that change rather than undesirability is the characteristic of life events that more accurately assesses their stressfulness. (Horowitz et al. 1979) observed that cumulative stress from the impact of life events, looking at measures of frequency, amount, and clustering of life changes, was the variable of greatest import.

Rahe (1980) has identified a certain imprecision of thought that has become apparent since the popularization of the life change and illness concept. It is simplistic to view this concept as a close and immediate relationship such as is apparent between the staphylococci endotoxin and acute dysentery. A model which embraces a series of intervening variables is required to identify the subtle and complex process of how certain life changes result in physical decline and even death for certain persons.

In conclusion, the numbers and diversity of life changes and illness studies to date have firmly established a significant relationship between subjects' recent life change experience and their subsequent illness and even death. Retrospective investigation has demonstrated a powerful relationship between recent life changes and near future illness; however, while demonstrating that recent life changes remain a significant predictor of near-future illness, prospective studies indicate that the relationship is a relatively weak one.



CHAPTER III

RESEARCH DESIGN AND PROCEDURES

This chapter has two major divisions, the DESIGN of the study, and the PROCEDURES that were followed to implement that design.

DESIGN

There are two separate design sections in this chapter. First, the Design Over Time section illustrates the overview of the procedures, and builds the foundation for the discussion on the validity of the research, i.e., Validity Concerns. Second, the Design Over Variables section details the interrelation of the variables used in the study and their analysis. It provides the foundation for the Research Hypotheses section.

DESIGN OVER TIME

This study takes the form of a post-test-only, control group design, similar to Campbell and Stanley's (1963, p. 25) design number 6. While the pretest is a concept deeply embedded in the thinking of researchers in psychology, it is not actually essential to experimental designs according to Campbell and Stanley. A post-test-only design was chosen because it was not possible to pretest subjects prior to their



decision to apply for admission to the retirement village. Figure 3.1 shows the relationship between the treatment (X), assignment of subjects (R), and measurements (O's).

R	X	O ₁	O ₂
R		O ₁	O ₂

Figure 3.1 DESIGN OVER TIME

Legend:

X: Treatment
 R: Group assignment
 O: Observations
 O₁ - Life Change Events
 O₂ - Urinary Free Cortisol Excretion

In considering the DESIGN OVER TIME, the following components of Figure 3.1 will be explained: EXPERIMENTAL TREATMENT (X), SUBJECTS within the experimental and control groups, and INSTRUMENTATION (O's).

EXPERIMENTAL TREATMENT

The experimental treatment is the anticipation of imminent relocation into a retirement village whose facility includes a progressive care option within the same building. This facility is presumed to be the final habitat and consequently, the last major move for the subjects. Discussion regarding the admission procedure and selection appears in the major section of this chapter entitled, PROCEDURES.

SUBJECTS

The population under investigation represents persons over 65 years of age who are living independently in Western Michigan. This population is healthy in terms of functional activity but will exhibit chronic diseases characteristic of the aged population at large.

The experimental sample of fifteen subjects was drawn sequentially from applicants accepted for residence at an established retirement community extended care facility serving a healthy middle to upper socio-economic status population in the Grand Rapids area. Over 45 percent of those applicants contacted agreed to participate in the study, a higher rate than expected due to the arduous nature of the overall design.

The control sample of fifteen subjects was drawn from a list of participants in the Voluntary Action Program (R.S.V.P.) in Grand Rapids and from additional lists of members in area church "circles." Only 35 percent of those contacted actually participated in the study. Those who refused stated that they were too busy for such commitment. In addition to being matched for age, functional health, educational and socio-economic background, the control group must have lived in their present residence for two years or longer with no current plans for relocation.

The nature of the study resulted in utilizing a purposive sample that met specific criteria. The study preferenced one

retirement facility to avoid interinstitutional variability. Although this particular sampling procedure may not yield a representative sample of the universe which could result in biased estimators of the variables studied and thereby restricting generalizations, the advantages and nature of the study appear to warrant its use.

Table 1 describes certain demographic characteristics in the experimental and control samples.

Anticipated Use of Facility by Applicants

All of the applicants to the retirement village were functionally healthy and capable of independent living in spite of the advanced mean age of eighty. Each applicant expressed the desire to choose with some feeling of reassurance both where and how they would be cared for in the event of a decline in health. The facility offers independent living units with meals and housekeeping services available for subscription. A supportive care unit is housed within the same architectural structure which permits contact with the other residents in the independent living unit while providing additional supportive care. The health center, also located within the building, provides 24-hour skilled nursing care. Admission to this unit may also be either temporary or permanent.

Interestingly, several movers anticipated using the facility during the winter months and returning to homes in Northern Michigan in late spring. A few planned to live in Florida during the winter and return to Grand Rapids for the remaining nine months as had been their



TABLE 1
DEMOGRAPHIC CHARACTERISTICS

VARIABLE	SAMPLE		
	TOTAL N=30	EXPERIMENTAL N=15	CONTROL N=15
Age			
mean	78.9	80.7	77
standard deviation		4.1	6
range		75-87	69-86
Sex			
female	25	13	12
male	5	2	3
Marital Status			
married	10	4	6
widowed	18	10	8
divorced	1	1	0
single	1	0	1
Education (grade completed)			
8 - 11	4	2	2
12 - 15	11	6	5
16 and over	15	7	8
Socio-economic Status			
1) Executives, professionals and business managers for large concerns -	15	7	8
2) Administrative personnel, proprietors of small businesses -	9	5	4
3) Clerical, sales workers, technicians, skilled employees -	5	3	2
4) Machine operators and semi-skilled employees -	1	0	1



life style. Most movers, however, planned to live in residence for the twelve months and would see their family and friends as often as before the move. However, there was generally expressed concern that the families would feel less obligated to visit once the mover was in a more protective environment.

The vacancy rates within the independent living units are calculated from previous records at 2.5 per month. During the study, an unusual situation developed where no vacancies were available for a six month period. Most of the subjects had anticipated relocation prior to the time of this study and expressed concern for moving during the winter months. Indeed, several subjects had sold their homes and most of their possessions, and were living in modest surroundings. The movers expressed the feeling that this period of waiting was more stressful than the move would be. Indeed, some of those who had refused to participate in the study had indicated that they felt they "couldn't take any more stress at this time." Others had indicated a willingness to participate in the study "after moving." Clearly, this period of waiting was perplexing, and expressions of anxiety were related to the "not knowing" when the actual move would occur. If anticipatory anxiety alone can effect cortisol production rates, then the reported stress in the experimental sample was expected to be positively correlated with cortisol excretion.

INSTRUMENTATION

This section first discusses the inventory of Life Change Events (01), and second, discusses the 24-hour urine collection for radioimmunoassay of urinary free cortisol (02).

Life Change Events Inventory

The Life Change Events Inventory is a modification of the Holmes and Rahe Social Readjustment Rating Questionnaire. Originally designed as a self-administered questionnaire, the SRRS scale of forty-three items documents significant changes in the subject's life in those areas of personal, family, community, social, religious, economic, occupational, residential, and health experience over the past few years. The military version entitled, the Schedule of Recent Experiences (SRE), restricted inquiry of those changes to the past four years, rather than the past ten year period previously assessed in retrospective analyses. Also, each of the SRE yearly assessments is subdivided into two month intervals. Wording was changed for more meaningful communication with service men. Two thousand nine hundred United States Navy officers and enlisted men completed the SRE questionnaire.

The Holmes and Rahe scaling method has a high correlation on mean judgments of item intensity between culturally different populations with "r" values usually over .90; however, the important variable in psychosomatic and psychological research is the cumulative stress from the impact of life events looking at measures of frequency, amount, and clustering of life changes. Thirty-seven of the items used in the Life Change Events Inventory for this study were obtained from the Social



Readjustment Rating Questionnaire (SRRQ). Two items on the SRRQ pertaining to loans and mortgages were combined into a single category, "mortgage over \$10,000." The five other items excluded were pregnancy, and a repetition of events related to formal schooling and current employment. Of the six items added to the inventory, a change in life style, (i.e., change in physical activity), accounted for one, and the other five related to changes in the social support of family and close friends. These were (1) marital problems, (2) trouble with close friend(s), (3) change in family situation of children, (4) change in health or behavior of spouse, and (5) change in health or behavior of close friend(s).

Radioimmunoassay of Urinary Free Cortisol

Tissue cortisol levels have been determined by fluorometry, gas chromatography and gas chromatography-mass spectrometry, competitive protein binding assay, and most recently, radioimmunoassay. Rosalyn Sussman Yalow, an American-educated physicist, was awarded the 1977 Nobel Prize for Medicine for her part in developing the sensitive radioimmunoassay (RIA) procedure. Although the specificity of determination of urinary free cortisol increased with the advent of the competitive protein binding assays, the specificity has increased even more with RIA. (Sokoloff and Hilderbrand, 1977)

Explanation and Usage of the Test

Cortisol is the major glucocorticoid which is secreted by the adrenal cortex. Among its physiological effects are anti-inflammatory activity, blood pressure maintenance, and the mobilization of lipid and carbohydrate stores.

The glucocorticoids transform protein to carbohydrate in response to adrenocorticotrophic hormone (ACTH) which is secreted by the anterior lobe of the pituitary gland. In the normal individual, cortisol participates in a negative feedback loop with ACTH through the hypothalamus-pituitary-adrenal cortex axis (HPA). Pituitary ACTH is, in turn, regulated by corticotropin-releasing factor (CRF) which is secreted by the hypothalamus. The hypothalamic CRF is responsive to cortisol levels and to stress. Physical and psychological stress, diurnal variation, and low blood sugars will affect the rate of cortisol secretion.

A malfunction of any of the organs in the HPA axis will result in alteration of the cortisol levels. The assay of circulating cortisol, therefore, assists in the clinical evaluation of individuals whose symptomatology suggests chronic adrenal insufficiency (Addison's Disease), Cushing's syndrome (adrenal overproduction), and hypopituitarism.

Tissue cortisol levels as a function of psychological or physical stress have been of particular interest in numerous investigations by Curtis (1972), Mason (1973), Miller (1970), Rose (1975), and Rubin (1969).

Principles of the Method

The GammaCoat ^{125}I Cortisol Radioimmunoassay was the commercially available kit selected for the quantitative determination of the urine cortisol level. This procedure is based on the competitive binding principles of radioimmunoassay and is used for the measurement of urinary free (unconjugated) cortisol. The cortisol present in the urine is first extracted into redistilled methylene chloride. An

aliquot of the extract is evaporated directly into the GammaCoat antibody-coated tube. To insure that the samples contain proper levels of protein, 10 microliters of Cortisol Serum Blank is added to each GammaCoat tube. The remainder of the assay procedure including preparation of a standard curve and monitoring for extraction efficiency is referenced under the proprietary name, GammaCoat, and is also part of normal laboratory procedure for clinical assays.

VALIDITY CONCERNS

This section discusses possible concerns for first, the internal validity of the study, and then the external validity. Internal validity asks the question: was the experimental treatment the real cause of the observed change? (Campbell and Stanley, 1963)

External validity asks the question: to what populations, settings, treatment variables, and measurement variables can this effect be generalized? Violations of external validity, therefore, reduce the generalizability of the findings.

INTERNAL VALIDITY

The design over time is a form of the post-test-only control group design. This is a design which Campbell and Stanley show to have excellent internal validity and controls for HISTORY, MATURATION, STATISTICAL REGRESSION, and EXPERIMENTAL MORTALITY. No unusual circumstances arose to warrant further discussion of the above concerns. However, the design's control over sources of invalidity arising from SELECTION, INSTRUMENTATION and TESTING is less clear and does warrant further discussion.

Because randomization is the most adequate all-purpose assurance of lack of initial biases between groups, a purposive sample may result in differential selection of respondents for the comparison groups. Therefore, additional observations concerning the selection process for those admitted to the retirement village will be reported in the last section of this chapter entitled, PROCEDURES.

The concern for the internal validity of an instrument requiring memory recall resulted in an instrument design which narrowed the time interval selections and repeated the responses for each item on the inventory. These intervals were collapsed into equal time segments for analysis. Therefore, events which the respondent indicated as having occurred within one week, one month, six months, or less than a year appear as "less than a year" in the data analysis.

The additional concern for internal validity relates to the efficiency of urine collection and preservation. Overcollection often occurs as a result of failure to discard the specimen at the beginning of the collection. A visual collection chart was designed as part of the collection procedure and careful instruction for each subject preceded each collection. The use of a commode pan with spout and a 3 inch cap on the gallon collection container facilitated the collection of accurate specimen. Appropriate storage of specimen in a 70° C freezer eliminated concerns for specimen deterioration.

Furthermore, diurnal variation has been avoided by the collection of a 24-hour urine sample rather than a single sample of urine, plasma or serum. The secretion of cortisol varies in a non-random, circadian rhythm (24 hours) with the greatest urinary excretion of

cortisol between 5:00 A.M. and 9:00 A.M. and the lowest excretion at approximately 9:00 P.M. (Lee, 1977). Therefore, invalidity arising from single sample collection has been avoided.

Questions relating to the effects of taking a test upon the scores of a second test might appear as a source of concern in a study designed to recall stressful life events and also measure a biochemical stress response, adrenocortical activity. The cortisol measure was chosen for its noted stability. Increased production of adrenocorticosteroids is associated with major life changes which are psychologically and/or physically stressful. Exceptions to this finding have been attributed to certain individuals' abilities to maintain effective psychological defenses against stress, including a suppression of cortisol secretion. An undue concern for testing effect in this study is probably unwarranted.

EXTERNAL VALIDITY

The threats to the external validity, or generalizability, are reasonably well controlled for in this design, although several possible threats to external validity identified by Campbell and Stanley warrant explanation.

The INTERACTION of TESTING and TREATMENT is not a significant concern since the treatment, anticipation of imminent relocation, is not manipulated by the study. However, the INTERACTION and SELECTION of TREATMENT and possibly REACTIVE ARRANGEMENTS identified by Campbell and Stanley (p.26) are a possible concern for external validity.

The INTERACTION EFFECTS of SELECTION BIASES and the EXPERIMENTAL VARIABLES are those associated with a purposive sample. Additionally, it should be noted that subjects will ordinarily vary in their willingness to participate, as was observed when approximately 60 percent of those contacted refused to participate. It should be further noted that those subjects participating demonstrated considerable effort towards the accurate recording of the requested data and the accurate collection of the urine specimen.

The INTERACTION EFFECTS are the basis for this study and the untoward effect upon the external validity would be to delimit generalizability to a population of similar characteristics.

The last concern for the external validity is the REACTIVE EFFECTS of EXPERIMENTAL ARRANGEMENTS. Under design 6 as selected for this study, REACTIVE ARRANGEMENTS are more controlled than in designs 4 and 5. The differential becomes even stronger in a research design for the social sciences than for research on educational instruction. Circumstances did not allow this experiment to be done so that subjects were unaware that they were participating in a study. Consequently, all subjects were equally informed that they were participating in a study and how they were being measured. All of the subjects believed they were in the experimental group. One group was told that the study concerned the stress effects associated with relocation. The other group was informed that the investigation was to study the stress effects associated with aging. The data collection from all subjects occurred at their places of residence. The experimental subjects were approached for observation as they appeared sequentially on a waiting list for admissions to the retirement village. Data collection was scheduled

when the experimental subjects anticipated imminent relocation within six weeks. The willingness of the experimental subjects to participate in a somewhat rigorous study while anticipating a major relocation may have resulted from an incorrect belief that their participation would positively influence their position on the waiting list of the facility. The consent form stated that the decision to participate was completely voluntary and would in no way effect their relationship with the facility.

In conclusion, the design of this study has been shown to be reasonably sound with respect to violations of either internal or external validity, thus the data collected is reasonably free from contamination.

DESIGN OVER VARIABLES

Whereas the design over time gave the overall picture of the procedures of the design, the design over variables gives the inter-relationship of the variables used in the study. It leads to the research hypotheses and together they lead to Chapter IV, the Analysis of the Results.

VARIABLE MATRICES

There are two dependent variables being tested, first is the number of life change events, and the second is the amount of urinary free cortisol excreted during a 24 hour period.

Life Change Events Variable. The independent variable in the Life Change Events variable matrix is the anticipation of imminent

relocation, from hence referred to as MOVERS. Each cell of the variable matrix contains the number of persons experiencing low, medium, or high numbers of Life Change Events for movers and non-movers.

Group	Life Change Events		
	Low	Med	High
Movers			
Non-movers			

Figure 3.2. Life Change Events Variable Matrix.

Urinary Free Cortisol Variables. Two variable matrices will be used to examine the urinary free cortisol hypotheses. The independent variable in the first matrix is the anticipation of imminent relocation (MOVERS). The dependent variable is the mean value of cortisol measured in micrograms per 24-hour urine excretion. This is a discrete variable with expected values within 20 μg to 90 μg per 24-hour sample with repeated measures expected to show little variance in a non-experimental context.

Group	Urinary Free Cortisol	
	Mean	Variance
Movers		
Non-movers		

Figure 3.3. Urinary Free Cortisol Variable Matrix

In the second UFC variable matrix, the independent variable is the frequency of life change events categorized by low, medium, and high number of LCE. In each cell the independent variable is the mean value of cortisol observed for each frequency category of LCE.

Group	LCE Frequency		
	Low	Med	High
Combined			
Movers			
Non-movers			

Figure 3.4. Urinary Free Cortisol by Life Change Events Variable Matrix.

STATISTICAL MODEL OF ANALYSIS

All hypotheses were tested at the .05 level of significance. The first hypothesis was tested using a χ^2 test of independence as illustrated in Figure 3.2. The usual assumptions of independence between and within groups are reasonably well met since subjects by self assignment were either anticipating an imminent relocation or were not. All subjects were equally eligible for application to the retirement home. The groups are assumed to represent a normal population. Five married couples participated in the study--two in the experimental group--which limited the independence within the groups to some extent.

Analysis of the second hypothesis is a t-test for differences between group means as shown in Figure 3.3. In addition to the assumptions previously stated, population variances are assumed to be equal.

The third hypothesis uses a one-way analysis of variance to compare the variability within and between the groups as illustrated in Figure 3.4. This follows an F distribution. Research has shown that even large violations of the assumptions of equality of variances and normal distribution have little effect on the ANOVA F -test when the design is balanced and cell sizes are equal. Since the design is balanced with nearly equal cell sizes, there is no reason to expect large violations of assumptions, and the ANOVA F -test is considered to be both normal in power and true level of significance.

RESEARCH HYPOTHESES

The testable hypotheses, stated in the research form, are given below. They are divided into the Life Change Events and the Urinary Free Cortisol hypotheses to be analyzed via their corresponding variable matrices given in the Design Over Variables section.

I. Life Change Events Hypotheses

Ho: There is no difference in the number of life change events between persons who anticipate imminent relocation and those who do not.

H₁: There is a difference in the number of life change events between persons who anticipate imminent relocation and those who do not.

II. Urinary Free Cortisol Hypotheses

A. Urinary Free Cortisol By Group

Ho: There is no difference in urinary free cortisol

values between persons who anticipate imminent relocation and those who do not.

H₁: There is a difference in urinary free cortisol values between persons who anticipate imminent relocation and those who do not.

B. Urinary Free Cortisol and Life Change Events

H₀: There is no difference in urinary free cortisol values between persons who have low, medium and high numbers of life change events.

H₁: There is a difference in urinary free cortisol values between persons who have low, medium and high numbers of life change events.

PROCEDURES

The procedures of the study are the actions that have been taken to implement the design. Many of the procedures of the experiment have already been outlined in the Design Over Time section of this chapter. This procedures section gives additional detail on the Admissions Procedure for Facility Applicants, the Selection Procedures for Experimental and Control Groups, the Interview Procedures, and additional modifications and instruction related to the Instrumentation and Data Collection.

Admissions Procedure for Facility Applicants

1. Personal Interview at the Retirement Village by the Administrative Director. Admission to the independent

living area depends on the physical functioning and mental status of the applicant as observed by the Director during the interview. Persons who primarily rely upon a wheelchair for mobility or who demonstrate mental confusion related to orientation are not given an application form.

2. The Formal Written Application. The application includes the usual demographic descriptors and a request for a financial statement and current medical report from the applicant's physician.
3. Home Visit. Two members of the Women's Board interview the applicants in their home. Further observations were made by the study to determine possible discriminatory practices related to religious preferences. Table 2 shows the religious mix of the groups. Current residents of the retirement village also include persons of the Jewish faith and Christian Reformed Dutch which are well represented in the community at large.
4. Review Process. The Admissions Committee reviews the recommendation from the Women's Board, the written application, and the Director's letter. Applicant names are presented at the following board meeting and a letter of acceptance with an estimated date of admission is sent to the approved applicants.

TABLE 2
RELIGIOUS PREFERENCE

Affiliation	Experimental	Control
Congregational	4	3
Episcopal	3	0
Presbyterian	2	1
Protestant	1	7
Methodist	1	1
Christian	1	0
Catholic	1	2
Baha'i'	1	0
None	1	0
Baptist	0	1

Data Collector. The experienced interviewer is a registered nurse with an extensive background in community and mental health, administration, and housing and environmental design.

Selection Procedures for Experimental and Control Groups.

Experimentals. The Administrative Director of the Retirement Village sent a letter to each applicant on the current waiting list stating the purpose and sponsorship of the study and assuring the voluntary nature of the participation. The content of the letter followed the format of the consent form which described the types of information requested and the urine collection, an assurance of confidentiality, and further acknowledgment that participation in the study would in no way influence the relationship of the applicant with the retirement village. The letter further stated that an experienced

interviewer would telephone the applicant to answer any questions about the study and to set a time for the interview (home visit). No commitment to the study was requested at this time.

Controls. For those contacts whose names appeared on area church circles, an introductory letter was sent from the Department of Community Health Science and was followed by a telephone call from the interviewer.

The contacts from R.S.V.P. were selected from the volunteer list of approximately 950 names. The selection criteria have been described in the Design Over Time section of this chapter. The letter of introduction was sent to these contacts from the Program Director of the Voluntary Action Center. This was followed by a telephone call from the interviewer.

During the initial home visit, a sample interview packet including the larger study was presented to the potential participants. All instruments and instructions could be examined prior to the agreement to participate. The data obtained specifically for this study included demographic information on the admissions form, a signed consent form, and the inventory of Life Change Events. During this initial interview all contacts agreed to participate and were interviewed at that time.

Following the initial data collection a date was confirmed for the collection of the 24-hour urine specimen. The collection most often occurred the following day; however, if a 24-hour period was to elapse prior to the onset of the urine collection, the interviewer agreed to call the participant on the evening prior to the collection. All

collections began upon the awakening of the subject on the morning designated for the collection.

Construction of Data Collection Instruments.

Life Change Events Inventory. The item inclusion on the Life Change Events Inventory have been described under Instrumentation in the Design Over Time sections of this chapter. Because this questionnaire was originally designed to be self administered, the design was modified to facilitate aged populations. This included the choice of a more appropriate type size, double spacing between items, and repeated responses. Additionally, related items were grouped in such a way to facilitate memory recall. The first grouping included items relating to family, friends, and support relationships which were measured as a loss. These were followed by items relating to the work situations or job changes. Next were changes in life style which could be perceived as adaptive in some instances to other events. Last, a category of events was listed which could be viewed as either directional, i.e. Christmas, vacations, financial.

The three year time frame used in the analysis was actually broken down into five time responses. These were as follows:

1. "less than a month"
2. "a month ago but less than six months"
3. "six months to about a year ago"
4. "about one year ago but less than two years"
5. "two years but less than three years ago"

The first three responses were collapsed into one interval for analysis as "less than one year." The fourth response was indicated

as "less than two years, more than one" and the last response was noted as "less than three years, more than two" in the data analysis.

When the respondent seemed vague about the time, the interviewer would ask questions as to the season of the year or relationship of the event to a major holiday.

In addition, when the death of a close friend or relative was noted by the respondent, the interviewer would ask if the person had been a close friend or merely an acquaintance.

To avoid duplication of the same event within the responses the interviewer would ask for the specific change noted. For instance, a change in residence does not necessarily indicate a change in life style. On the other hand, if a person noted a change in recreation as not playing golf weekly, this was not duplicated as a "change in social activities" or a "change in physical activity" but as a "change in recreation." When specific dates were remembered, such as in the instance of "death of a spouse," these were noted even though they were not within the three year time frame and were, therefore, not part of the data analysis.

Twenty-four Hour Urine Collection. The 24-hour collection of the urine sample was facilitated by the use of a commode pan, a gallon collection jug, and a written schedule of instruction. The written instructions were as follows:

1. Good Morning! EMPTY YOUR BLADDER. DO NOT SAVE. Write the time here _____.
2. Place the commode pan in place as demonstrated on the toilet rim under the seat.

3. Now save all urine specimens for the rest of the day and night. Carefully pour each urine specimen into the brown jug. Save, save, save, save, save and have a good night's sleep save save.
4. Good Morning! Your last specimen to be saved in the brown jug will be at about the same time you wrote down yesterday. Write the time you give your last specimen now _____.
Thank you.

All subjects were asked these questions during the explanation of the procedure: what time do you usually awaken in the morning? Following that response the subject was asked to repeat the collection procedure. Next, the question was: how often do you get up at night to empty your bladder? And: are you awake enough to remember to save the specimen?

The interviewer demonstrated the appropriate use of the commode pan and the collection jug in the subject's bathroom and then requested that the subject repeat the collection procedure. Before leaving, the interviewer again noted the appropriate time when the first specimen was to be discarded and the last specimen was to be saved.

At an appointed time, the interviewer collected the specimen and equipment. Next, the total volume was measured in a laboratory and appropriate samples were prepared for freezer storage. The mini-vials were labeled with the study number, name, date, time and volume of the collection. The polypropylene mini-vials (8 mm) were then stored in a -70° C freezer.

The collection procedure was facilitated by the use of a special commode pan and a collection jug. The commode pan was designed to fit under the rim of the toilet seat and had a collection capacity of 800 cc which was especially useful during the night-time collections. A small dip in the rim of the commode pan facilitated ease in pouring the specimen into the collection jug.

The collection jug was a gallon jug with a 3 inch diameter cap for ease in both pouring and opening the jug. The amber color was selected for light sensitive material to preserve the integrity of the collection and the polyethylene construction was both light weight and durable. The 3 inch opening facilitated the pouring from the commode pan and the direct collection by male subjects.

The procedures have described the selective process for the purposive sample and further described measures taken to insure accuracy and efficiency of the data collection and process.



CHAPTER IV

ANALYSIS OF RESULTS

This chapter is divided into two major parts. The first part reports the findings of the study, and the second part is a discussion of the interpretation of those findings.

FINDINGS

There are findings in three major areas: first are the findings associated with the life change events for movers and non-movers; second are those findings of urinary free cortisol (UFC) mean distribution in movers and non-movers; and finally are those findings of UFC values associated with life change event (LCE) frequency distribution for the past three years. In each case, the hypothesis is restated, the summary table and associated tables are given, followed by a discussion related to the hypothesis as a summary statement.

LIFE CHANGE EVENTS

INTERVAL DETERMINATION FOR RATING AMOUNT OF LIFE CHANGE EVENTS

The frequency and distribution of the numbers of life change events for each subject provided the interval selection data used for determining low, medium (med), and high (hi) categories of life change events (LCE).

Table 3 shows the frequency of the number of LCE reported by all subjects within the three year period and the interval selection for low, medium, and high categories with a mean of 8.7 events per subject.

TABLE 3
FREQUENCY CATEGORIES OF LCE

CATEGORY	NUMBER LCE WITHIN 3 YEARS	N	FREQUENCY
LOW	4	8	4
	5		2
	6		2
MED	7	11	6
	8		1
	9		4
HI	10	11	3
	11		3
	12		2
	13		1
	17		1
	20		1

Hypothesis: There is no difference in the number of life change events between persons who anticipate imminent relocation and those who do not.

The distribution of life change events for movers and non-movers was analyzed by a χ^2 test of independence ($\chi^2 = 1.409$, d.f. = 2, NS).

In the χ^2 test of independence, we cannot reject the null hypothesis of no difference in the numbers of movers and non-movers who experience low, medium, and high numbers of life change events. Table 4 shows frequency in LCE categories by group.

TABLE 4
FREQUENCY DISTRIBUTION OF
LCE CATEGORIES FOR MOVERS AND NON-MOVERS

GROUP	LCE CATEGORY		
	LOW	MED	HI
MOVERS	3	7	5
NON-MOVERS	5	4	6

Since the decision to relocate was made during the preceding three year period, additional analyses were performed to determine if the number of life change events within each of these three years was significantly different between and within groups. Table 5 reports the summary of the data for number of LCE for movers and non-movers by year.

TABLE 5
NUMBER OF LCE FOR MOVERS AND NON-MOVERS BY YEAR

Life Change Events	Movers	Non-movers	χ^2	d.f.	α
Less than ONE Year	34	62	39.57	28	.0722
Less than TWO Years	54	39	27.75	23	.2254
Less than THREE Years	39	33	22.68	24	.5386
Total	127	134	30.58	32	.5382

While the data by year continues to support the findings of no significant difference in numbers of life change events for movers and non-movers, the raw count appears to show a greater number of LCE for movers in the interval of less than TWO YEARS, and a greater number of LCE approaching a level of statistical significance for non-movers in the interval of less than ONE YEAR. A further look at the data indicate that the item, Christmas, is perhaps a contaminating factor in these intervals. Since the LCE inventory contains both positive and negative items, Christmas was indicated by all respondents. Thirteen of the experimental subjects indicated that Christmas had occurred "about a year ago but less than two years." These subjects were interviewed in late fall and early winter prior to the holidays. Fourteen of the control sample were interviewed in mid-winter to late spring and therefore indicated that Christmas had occurred in "less than a year." Table 6 represents a revision of the total number of LCE per year for movers and non-movers with the exclusion of the item, Christmas. A more even distribution becomes apparent between years and within groups.

TABLE 6
NUMBER OF LCE BY YEAR FOR
MOVERS AND NON-MOVERS, CHRISTMAS EXCLUDED

YEAR	MOVERS	NON-MOVERS	FREQUENCY
Less than ONE Year	32	48	80
Less than TWO Years	41	38	79
Less than THREE Years	39	33	72
Total	112	119	231

ASSOCIATED ITEMS WITHIN THE LCE INVENTORY

The LCE Inventory contains items related to changes in social support, changes in life style, and other events. Some studies have demonstrated an inverse relationship between social support and the effects of stress; therefore, the changes in social support were compared for movers and non-movers within this study. In addition, changes in life style, which may accompany changes in social support, were also analyzed. Table 7 summarizes the life change events by factoring the events into the four categories of (1) social support, (2) life style, (3) events, and (4) relocation. The item, relocation, was isolated as a contaminating variable since the inclusion criteria for the control sample restricted participation to those who had lived in their present place of residence for two years or longer.

TABLE 7

NUMBER OF LCE FOR MOVERS AND NON-MOVERS BY FACTORS
OF SOCIAL SUPPORT, LIFE STYLE, EVENTS, AND RELOCATION

Factors	Item N	MOVERS	NON-MOVERS	Frequency
SOCIAL SUPPORT	11	40	42	82
LIFE STYLE	14	37	37	74
EVENTS	7	42	53	95
RELOCATION	1	8	2	10
TOTAL		127	134	261

A χ^2 value equal to 4.74 with three degrees of freedom indicates no significant difference ($p \leq .1920$) in the amount of change with factor factored items for movers and non-movers.

The legend for factored items is as follows: (Appendix)

Social Support - 1, 2, 3, 10, 12, 13, 14, 16, 17,
18, 31

Life Style - 19, 20, 21, 22, 23, 25, 27, 28, 29, 30,
32, 33, 34, 35

Events - 15, 24, 36, 37, 38, 39, 40

Relocation - 26

Ten items on the 43-item Life Change Events Inventory received no response from the subject and were, therefore, excluded from the legend.

Social Support

The social support factor contains three items related to loss by death. These are (1) death of spouse, (2) death of close family member(s), and (3) death of close friend(s). Table 8 shows the distribution of loss for movers and non-movers.

TABLE 8
COMPARISON OF LOSS BY DEATH WITHIN THE
PAST THREE YEARS FOR MOVERS AND NON-MOVERS

Loss By Death Items	Movers	Non-Movers	Frequency
Total	25	31	56
Death of Spouse	4	0	4
Death of Close Family Member(s)	9	18	27
Death of Close Friend(s)	12	13	25

The overall loss by death appears comparably distributed for movers and non-movers with the noted exception of death of spouse. A

2 x 2 contingency table was constructed for computing a frequency distribution for death of a spouse. The $\chi^2 = 4.615$ with one degree of freedom is statistically significant at $p \leq .05$. This would suggest that the death of a spouse is associated with the decision to relocate.

Table 9 is a summary of the two factors, social support and life style, by year for movers and non-movers.

TABLE 9
COMPARISON OF SOCIAL SUPPORT AND LIFE STYLE
FACTORS BY YEAR FOR MOVERS AND NON-MOVERS

Factors	Group	>1	1>2	2>3	Frequency
Social Support	Movers	8	13	19	40
	Non-Movers	10	15	17	42
Life Style	Movers	11	15	11	37
	Non-Movers	24	8	5	37

The data reveal a comparable distribution of life change events for both movers and non-movers over the past three years. Changes in social support and life style are evenly distributed both between groups and factors. The changes in social support may be greater than is apparent since these changes are representative of 11 items in the social support scale; whereas, there are 14 items in the life style factor.

Life Style

The changes in life style were not statistically different between groups; however, the distribution between items indicates a

selectivity which may be characteristic of this age sample. Those changes in life style which occurred to more than 25 percent of the total sample within the three year period are reported in Table 10.

TABLE 10
SIGNIFICANT LIFE STYLE CHANGES

Item	Movers	Non-movers	Frequency
Personal injury or illness	11	10	21
Change in eating habits	5	3	8
Change in physical activity	6	5	11

These reported life style changes are evenly distributed between movers and non-movers with $\chi^2 = .2407$, two degrees of freedom at a $p \leq .05$ level. Table 11 shows the distribution of personal injury or illness by year for movers and non-movers. This table is of interest in observing whether personal injury or illness precedes the decision to move or may follow such a decision.

TABLE 11
PERSONAL INJURY OR ILLNESS BY YEAR BY GROUP

Group By Year	<1	1<2	2<3
Movers	2	5	4
Non-movers	6	2	2

Not significant at $\chi^2 = 3.9$, d.f. = 2, $p \leq .05$

Events

Table 12 shows those other changes--EVENTS--which were experienced by over 25 percent of the total sample. These changes were not statistically different between groups with $\chi^2 = 1.398$, 2 d.f. at a $p \leq .05$ level.

TABLE 12
SIGNIFICANT EVENTS BY GROUP

Items*	Movers	Non-movers	Frequency
Gain in new family member	6	8	14
Vacation or long trip	13	20	33
Change in financial state	5	3	8

* Christmas excluded

Relocation

Relocation was factored out of the other analyses of changes in life style or events to control for the validity concerns associated with the inclusion criteria of the control sample which required a current residency of at least two years. Even so, two of the control subjects had relocated in the less than three year period. Another eight relocations were reported by the experimental sample to have occurred within the past three years. This finding is in contrast to the presupposition that the movers would be leaving a habitat of adult family "life-time" residence.

ITEM ADDENDUM TO LCE INVENTORY FOR MOVERS

Following the completion of the LCE Inventory, each mover was asked to indicate on the time intervals, in like manner, when they had



decided to move. Table 13 shows the decision by year, and is followed by the results of a χ^2 test of independence to determine if the decision to relocate was related to the frequency of LCE by year. (Table 14)

TABLE 13
DECISION TO MOVE BY YEAR

Decision by Year	<1	1<2	2<3
Movers	4	7	2

Of the 15 movers, only 13 responded to this item in a measurable manner. One subject stated that she did not know, and the other subject responded that she had never decided to move. The decision apparently had been that of her daughter and the subject expressed strong displeasure at not being allowed to remain in her present dwelling which is a mobile home.

TABLE 14
 χ^2 of Decision Year By Frequency of LCE

Year	χ^2	d.f.	α
<1	6.73214	6	.3463
1<2	11.02679	10	.3554
2<3	12.69048	12	.3919
Total	13.00	12	.3690

The findings indicate that the decision to move was independent of the frequency distribution of life change events.

SUMMARY FOR FINDINGS RELATED TO LIFE CHANGE EVENTS

A χ^2 test of the hypothesis suggests that there is no difference in the number of life change events between movers and non-movers. A comparison between groups of low, medium, and high numbers of events is also evenly distributed with a mean of 8.7 events per subject over the past three years. The item of statistical significance between groups was death of a spouse. The cell sizes are small, as might be expected for this item. However, the death of a spouse appears to be strongly associated with the decision to move; whereas, other changes in social support failed to show an association with relocation.

Changes in life style indicate a greater frequency for items of personal injury or illness, changes in physical activity, and changes in eating habits for persons age 70 or older. These items account for over one-half of the responses in the Life Style factor.

An unexpected finding is that relocation had occurred to more than 50 percent of the movers within the past three years. The decision to relocate appears to be independent of a clustering of other life change events; however, this finding may be viewed cautiously with the rate of relocation significantly higher within the past three years than was expected.

URINARY FREE CORTISOL

Urinary free cortisol excretion was determined for each subject by radioimmunoassay of the 24-hour urine sample. A t -test for differences between group means was used to test the hypothesis. (Table 15)

Hypothesis: There is no difference in urinary free cortisol values between persons who anticipate imminent relocation and those who do not.

TABLE 15
UFC EXCRETION RATE BY GROUP

Group	<u>n</u>	Urinary Free Cortisol	
		Mean	Variance
Movers	14	23.29	75.1429
Non-movers	15	25.00	71.1429

The t -test = .54 with 27 degrees of freedom is not significant at an alpha level of .05. Thus the data support the hypothesis that there is no difference in the mean values of UFC for movers and non-movers. Therefore, the data analysis has failed to reject the null hypothesis.

Table 16 shows the frequency distribution of the discreet variable, urinary free cortisol, for the total population sampled. The UFC values are expressed in micrograms per 24-hour urine sample.

Expected normal values are published at 20 μ g to 90 μ g for 95 percent of the adult population. However, evidence suggests that certain individuals suppress their cortisol secretion during major stress; therefore, the excretion rates below 20 μ g are less of a concern than the outliers with higher values. Prior to the UFC determinations, the decision was made to treat excretion rates over 100 μ g as indicative of possible tissue pathology, thus excluding them from the study. Table 16

TABLE 16
FREQUENCY DISTRIBUTION OF UFC FOR TOTAL SAMPLE

UFC	Frequency	
	Total	Movers
13	2	1
14	1	1
15	2	1
16	2	2
17	2	
18	1	
21	2	1
22	2	1
24	1	
26	1	1
27	6	4
29	1	1
31	1	
33	2	
36	1	
41	1	
46	1	1
108	1	1



shows an outlying value of 108 μg for an experimental subject. The inclusion of this value would significantly affect the findings by increasing the mean and variance of the experimental group and would lead us to reject the null hypothesis and commit a Type I error. Therefore, all findings related to UFC excretion are based upon a sample size of 14 for the experimental and 15 for the control group. The combined data indicate a mean value of 24.172 μg for UFC with a standard deviation of 8.456. The mode of 27 μg was observed in six subjects.

Summary of UFC Findings for Movers and Non-movers

Gross differences in group mean values for movers and non-movers failed to appear. This is not surprising since the aged respond in a manner which is both heterogenous and unpredictable to the stress of relocation. The range of values was fairly evenly distributed for movers and non-movers; therefore, we cannot reject the null hypothesis of no difference in the mean of variance for the observed groups.

URINARY FREE CORTISOL AND LIFE CHANGE EVENTS

The previous section observed four differences in UFC values between groups. This section will test for differences within and between groups by category of life change events via a one-way analysis of variance.

Hypothesis: There is no difference in urinary free cortisol values in persons who have low, medium, and high numbers of life change events.

Table 17 is a comparison of UFC mean values by group for each frequency category of life change events. This is followed by a summary of the analysis of variance in Table 18.

TABLE 17
COMPARISON OF UFC VALUES BY GROUP
AND LCE FREQUENCY CATEGORY

Group	LCE Frequency		
	Low	Med	High
Movers	22.00	21.83	27.00
Non-movers	28.88	25.50	22.00
Combined	25.88	22.70	24.27

TABLE 18
ANOVA FOR UFC AND LCE

Source	D.F.	M.S.	F Ratio
Between Groups	2	22.4906	.2988
Within Groups	26	75.2753	

The analysis of variance of UFC values for movers and non-movers by frequency category of life change events is not significant $F_{2,26} = .2988$, $p \leq .7442$.

Table 19 is a comparison of UFC values for movers and non-movers of variance within LCE frequency categories.



TABLE 19
VARIANCE OF UFC BY LCE CATEGORY

Category	Group	n	Urinary Free Cortisol	
			Mean	Variance
Low	Movers	3	22.00	49.00
	Non-movers	5	28.20	82.70
Med	Movers	6	20.83	42.17
	Non-movers	4	25.50	59.66
Hi	Movers	5	27.00	141.50
	Non-movers	6	22.00	76.00

Table 20 presents the UFC summary data for comparison of the LCE within frequency categories of low, medium, and high. Of particular interest is the variance for movers who have experienced high numbers of life change events within the past three years.

TABLE 20
UFC SUMMARY DATA OF LCE FREQUENCY CATEGORY BY GROUP

Group	n	Mean	Variance
Movers			
Low Events	3	22.00	49.00
Med Events	6	20.83	42.17
Hi Events	5	27.00	141.50
Non-movers			
Low Events	5	28.20	82.70
Med Events	4	25.50	59.67
Hi Events	6	22.00	76.00



A χ^2 test for variability within groups was statistically significant with $\chi^2 = 30.9297$ with 2 degrees of freedom at less than the $\alpha = .05$ level. Whereas, there was no significant difference in mean values between and within groups which would lead us to reject the null hypothesis, there is considerable difference in the variance of UFC values for movers experiencing high numbers of life change events within the past three years.

Additional Findings Related to UFC and LCE Analysis

An unexpected finding was observed in the UFC values of those couples participating in the study. Table 21 is a summary of mean differences in UFC values for two couples expressing a relationship conflict during the interview and for two other couples who evidenced a strong affective relationship. A fifth couple presented a consistent dominant-husband/submissive-wife relationship with the wife remaining virtually silent and in obedience of her husband's requests during the interview. Table 21 presents the mean of the UFC values for couples by relationship.

TABLE 21

COMPARISON OF UFC MEAN DIFFERENCE IN MARRIED COUPLES BY RELATIONSHIP

Couple Relationship	n	Mean Difference Of UFC Values	Movers
Conflict Relationship	2	24.50 μg	1
Affective Relationship	2	3.5 μg	1
Dominant/Submissive	1	12.0 μg	0



This finding is supportive of previous studies reporting a physiological covariation among persons who are mutually involved in an affiliative way within a circumscribed environment. The interpretation of the clustering of UFC values will be discussed in the section of this chapter entitled, Interpretation of Findings.

Summary Related to UFC and LCE Analyses

The analysis of variance of UFC values by LCE frequency categories for movers and non-movers indicated that the differences were not statistically significant. However, further testing of the variances by LCE frequency categories for movers and non-movers revealed a significant finding. A χ^2 test of variances indicated that movers who experience high numbers of life change events within three years prior to imminent relocation have a statistically greater variance in UFC values than other categories of movers and non-movers.

An additional, unexpected finding which would support the notion of physiological covariation for persons who evidence a strong affective relationship within a mutually cooperative environment was observed.

INTERPRETATION OF FINDINGS

The preceding portions of this chapter have presented the statistical findings of the study, including only those interpretations and discussions necessary to support additional analyses. The remaining part of the chapter interprets the meaning of those findings. The interpretation section is organized in the same order as the earlier findings section. The interpretations of the life change events are presented first.

LIFE CHANGE EVENTS

The purpose of assessing the life change events for each person is to obtain a global view of the frequency, clustering, and amount of change within a short time span--three years--which is associated with a major change in habitat. The anticipatory phase of relocation which is being investigated is presumed to be stressful, both physically and psychologically. The notion of a crescendo effect when life change events tend to cluster would suggest that stress or the outcome measure of stress is not causally related to the observed event but rather a cumulative effect.

Interpretation 1. The anticipatory phase of relocation is independent of the frequency, clustering, and number of other life changes.

With the exclusion of the ambiguous item, Christmas, the amount of life changes were evenly distributed by year for both movers and non-movers and also between groups.

Interpretation 2. Individuals of age 70 and older can expect to experience two to three major life changes yearly (Christmas excluded).

The interval selection of low, medium, and high LCE was independent of the data collection. Whereas two persons, one mover and the other a control, experienced a high number of LCE--17 and 20 LCE respectively--the mean was approximately 8 LCE for each group within the three year period.

The factor of social support contains a predominance of items which would be expected to occur possibly once in a person's lifetime. The difference in factors of social support, life style, and events are not statistically significant; however, an interpretation of the items selected and amounts of changes in social support would logically follow.

Interpretation 3. The changes in social support for the elderly are significant, and are related to loss of close friends and family by death rather than by conflict within those relationships.

During the interview the investigator observed that subjects responding to the item of loss appeared to discriminate between loss of a close friend/family member and loss of an acquaintance, neighbor, or family member viewed as emotionally distant.

When items are compared by groups, a significant finding for death of a spouse is associated with movers. Of the eight widowed subjects in the control group, none had experienced the death of a spouse within the past three years; whereas, the experimental group reported four deaths of spouse for the same period. There were ten widowed subjects in the latter group and one death of a spouse had occurred followed by a marriage. Even though the number is small, it indicates that over 25 percent of the movers had experienced the death of a spouse.

Interpretation 4. The death of a spouse is strongly related to the decision to relocate in persons 70 years of age and older.

When changes in life style are compared for movers and non-movers, there is no significant difference. However, certain items appear to occur with greater frequency when compared with other items.

Interpretation 5. The changes in life style for persons aged 70 and older are associated more often with personal injury or illness, changes in physical activity, and changes in eating habits.

The three life style changes (1) personal injury or illness, (2) change in physical activity, and (3) change in eating habits, occurred twice as often as the 11 other reported changes.



The inclusion criteria are selective towards physical activity and mobility requiring a level of function necessary to maintain independent living. The reported decline in physical activity within the past three years appears to be related to activity within the micro-environment rather than inter-environment mobility. The reports of long trips or vacations included intercontinental travel and living for two or three months in a warmer climate.

The incidence of relocation in the aged population cannot be empirically determined in a study of this design. However, while the decision to move is independent of the frequency of life change events, we have observed a relationship to the single event, death of spouse. Furthermore, the observation that over 50 percent of the movers had relocated within the past three years indicates a higher frequency of relocation than was expected.

Interpretation 6. Inter-environment mobility, including relocation, occurs with greater frequency than often expected in persons age 70 and older.

In summary, major life changes for persons 70 years of age and older occur at the rate of two to three per year. Approximately one-third of these changes are the loss of a close friend or family member by death. The decision to relocate is strongly associated with the death of a spouse.

No evidence was found to support the notion of a crescendo effect; therefore, the decision to relocate is independent of frequency, clustering, and amount of other life change events.



URINARY FREE CORTISOL

Once an individual decides to move, true baseline data are no longer available. This general assumption stems from the theoretical framework where relocation is conceptualized within a time component which begins with the decision to relocate. Once the person has acted upon that decision and has been accepted for admission, the waiting period prior to the day of the actual move is called the anticipatory phase. The stress during this anticipatory phase was investigated by the objective assessment of cortisol excretion (UFC) as well as the inventory of life change events.

Prior to the postulation of the hypotheses, a logical interrogatory sequence led to those research questions which appear in Chapter III, entitled Research Design and Procedures. Those underlying assumptions related to the interpretation of findings are presented in the following sequence of questions.

Question 1. Do older people who move experience a significant increase in stress as measured by UFC compared to non-movers of a comparable age?

Question 2. If movers do experience a significant increase in stress as measured by UFC, does it appear in the anticipatory phase of relocation?

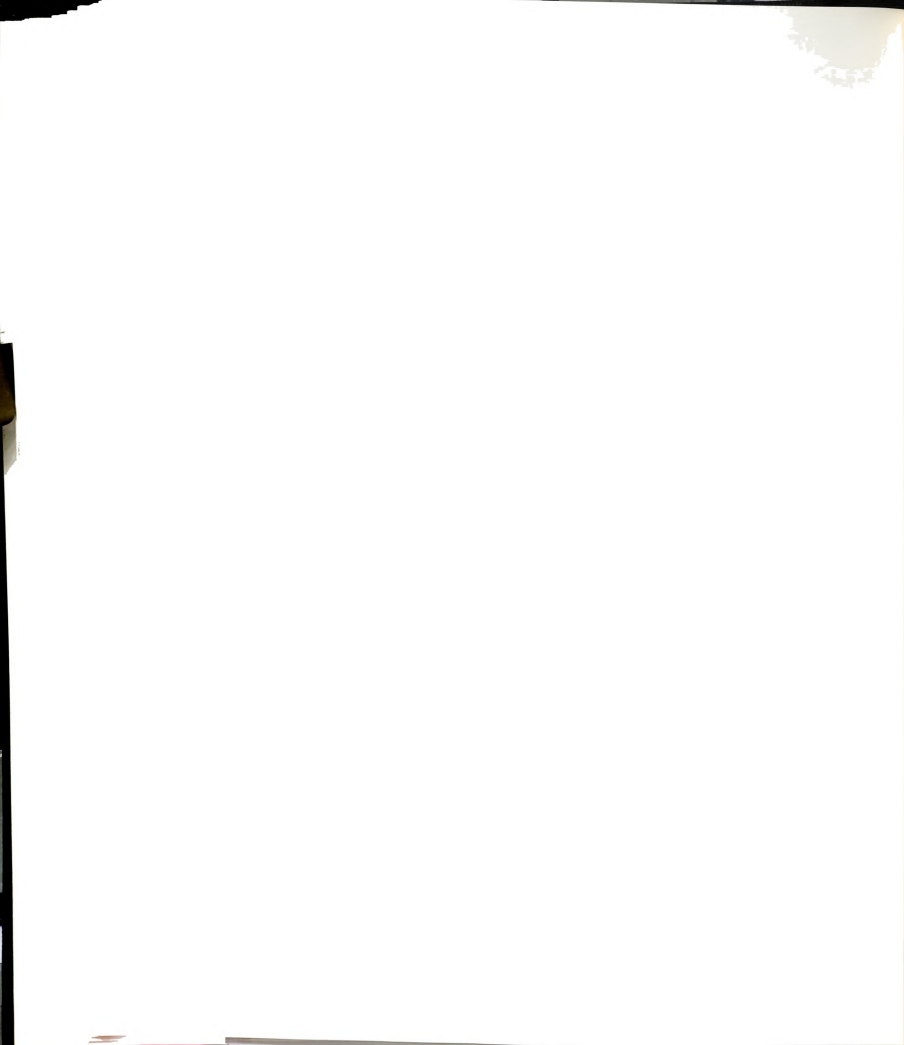
Question 3. If movers experience more stress as measured by UFC, is it related to the move or is it related to the frequency, clustering, and amount of life change events within a three year period?

Question 4. Since the true effects of a move are best measured by a pre- and post-move assessment, can a prospective study obtain baseline data given the formerly stated assumption that once an individual decides to move, true baseline data are no longer accessible.

Following this logical sequence, it would appear that once persons are anticipating imminent relocation they are different from those persons comparable age who are not anticipating a move. As an objective index of stress, a difference in UFC and LCE for movers and non-movers would be of no surprise. In fact, stress studies comparing tissue cortisol levels were cited in Chapter II, entitled Review of Related Literature. For purposes of a longitudinal design which seeks to measure the stress effects of relocation, the question of whether or not a basal value of cortisol can be obtained in a population stressed with the anticipation of imminent relocation is of theoretical and scientific significance. That this design denotes the observation prior to relocation as O_1 rather than O_0 or baseline value, defers to the assumption that a population anticipating imminent relocation will differ in cortisol value from that of a matched sample of non-movers.

Interpretation 7. The noted stability of cortisol secretion is not affected by the stress associated with the anticipatory phase of relocation.

The finding that there is no difference in the cortisol mean values of movers and non-movers is significant to the research design. This is not to imply that there is no difference in individual responses within the movers, however. Since the aged respond to relocation in a manner that is both heterogeneous and unpredictable, subtle differences may well be obscured. The method of collapsing the data for analysis may confound the existing differences.



URINARY FREE CORTISOL AND LIFE CHANGE EVENTS

The purpose of comparing UFC values and LCE frequency is to identify subtle differences within groups. As previously noted, the aged respond to the stress of relocation in a manner that is both heterogenous and unpredictable.

Interpretation 8. An increase in the frequency of life change events does not affect the group mean cortisol values. In other words, cortisol secretion remains relatively stable regardless of the frequency of other major life changes.

An important finding is that for those persons who have experienced high frequency of life change events within the three year period, the variability of cortisol response is significantly greater for movers.

Interpretation 9. When individuals have experienced a high number of major life changes and are anticipating imminent relocation, their defensive or coping response will be associated with either a suppression or increase in cortisol secretion.

The interpretation of individual cortisol response for movers with high LCE is relative to the group mean and appears to be a valid comparison given the equality of group means for movers and non-movers by LCE frequency category.

The unexpected finding of homogenized cortisol values for couples who evidence a strong affective relationship is supportive of the concept of physiological covariation.

Interpretation 10. When people who work and live together experience a strong affective relationship, their cortisol levels tend to homogenize.

While this interpretation is best viewed with caution in the face of a sample size of five couples, other empirical studies support this interpretation.



Noted investigators in the fields of social ecology have distinguished environments on the basis of how close their members feel toward each other. Moos (1974) conceptualizes this relationship as cohesion or affiliation which results in physiological covariation between the members of an environment. The following studies of individuals working closely together show a clustering on certain physiological indices.

Marchbanks (1960) and Miller (1968, 1970) report findings in similar studies in which closely working crewmen on a long B-52 flight were found to secrete similar levels of 17-OHCS per day. Moos (1974) reports a study in which clustering of 17-OHCS levels occurred in two all-female groups in a volunteer ward of college-aged adults. A mixed sex ward had no clustering, even after five weeks. This suggests that something more than simple exposure to a common physical environment was responsible for the clustering in the all-female groups.

McClintock (1970) reports finding covariation of menstrual cycles occurring in best friends and roommates in a college dormitory. Randomly selected pairs of females in the dormitory did not show covariation. There are other studies using physiological indices other than adrenocortical secretion which support the conclusion that affiliation and not simply exposure to common environmental stimuli is responsible for physiological covariation. (Kaplan et al. 1964) (DiMascio, 1955, 1957) (Coleman et al. 1956)

In this study, couples required approximately two hours to complete the interview. The conflict relationships were identified from verbal expressions of displeasure with the spouse or the spouse's



opinions. One couple was requested to complete the questionnaire in separate rooms. The couple identified as dominant/submissive remained consistent throughout the interview with the wife appearing dutifully obedient and the husband expressing the family opinions. The couples identified as evidencing an affective relationship tended to respond as individuals with a mutual respect for the spouse's response.

SUMMARY OF INTERPRETATION OF FINDINGS

The following interpretations of life change events and urinary free cortisol excretion for persons anticipating imminent relocation were made as a result of this study.

1. The anticipation of imminent relocation is independent of the distribution of other major life change events.
2. Persons aged 70 and older can expect to experience two to three major life changes yearly.
3. The changes in social support are related to loss of close friends and family by death.
4. The death of a spouse is associated with the subsequent decision to relocate.
5. Life style changes for persons 70 years of age and older are more often associated with personal injury or illness, and also with changes in physical activity and eating habits.
6. Persons aged 70 and older continue to travel on long trips or vacations.
7. The stress associated with anticipating relocation fails to illicit a universal response in cortisol excretion rates that differs from non-movers.

8. Group mean cortisol values when compared by LCE frequency categories, are equal for movers and non-movers.

9. Differences in coping style or defensive response may account for the significant variance in cortisol values for movers who have experienced high numbers of life change event.

10. Cortisol levels tend to homogenize in those couples who evidence a strong affective relationship.



CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter is divided into three major sections as follows. The SUMMARY AND CONCLUSIONS section reviews the objective of the study and the procedures used to meet that objective, and the conclusions drawn directly from the data. The next section is a DISCUSSION of these conclusions and of issues related to the choice and anticipated use of the facility. The RECOMMENDATIONS section applies those conclusions to a rationale for further research and for implications in policy and design related to housing for the aged.

SUMMARY AND CONCLUSIONS

PURPOSE AND OBJECTIVES

The purpose of this research was to study the stress of relocation as measured by life changes and urinary free cortisol excretion. The specific objectives of the study were: first, to compare the level of urinary free cortisol as an index of stress for those persons who were anticipating imminent relocation with that of a matched sample of non-movers; second, to compare the frequency, clustering and number of life change events for each of the two groups; third, to compare the cortisol level for the three categories of persons experiencing low, medium, and high frequency of life change events.



The two primary research questions were as follows:

1. Is there an association between an increased number of life change events and the anticipation of imminent relocation?
2. Is there a relationship between the anticipation of imminent relocation and urinary free cortisol excretion?

PROCEDURES

The first procedure was the administration of the Life Change Events Inventory to each of the 30 participants during a home visit by a registered nurse. One-half of the subjects were anticipating imminent relocation into a retirement village. The control sample was matched for demographic characteristics and level of functional health. In addition, the control sample was required to have lived in their current residence for at least two years with no plans for relocation at this time.

The LCE Inventory was a modification of the Holmes and Rahe Social Readjustment Rating Questionnaire, and included factored items related to social support and changes in life style, as well as other events. The response index of this instrument was designed to stimulate memory recall and facilitate the recording of events occurring within the past three years.

The second procedure was the collection of a 24-hour urine specimen by each subject at their place of residence the day following the administration of the LCE Inventory. The urine samples were appropriately measured, labelled, and frozen at -70° C in mini-vials



Subsequently, the radioimmunoassay of urinary free cortisol was reported for each participant.

CONCLUSIONS

This section contains the most important findings of the study as they have been interpreted.

Conclusion 1. The difference in the variance of urinary free cortisol (UFC) excretion rates for movers reporting a high number of life change events over the past three years was statistically significant when compared with non-movers reporting high numbers of LCE. This finding remained significant when compared to movers and non-movers reporting medium or low numbers of LCE.

Conclusion 2. The cortisol production rate is robust and the stress associated with imminent relocation does not elicit a response dissimilar to non-movers of like characteristics in this study when group mean values are compared.

Conclusion 3. When relocation is associated with an increase in the number of life change events, the variance in UFC may be indicative of a difference in individual defense mechanisms and coping style.

Conclusion 4. Because the variance in cortisol excretion was more pronounced for movers who had also reported a high number of life change events, a longitudinal study may differentiate those defense mechanisms which best serve the long-term adjustment.

Conclusion 5. Major life changes numbered two to three yearly for all persons studied. The loss of social support due to death of a spouse, other relatives, and/or close friends accounted for



approximately one-third of those LCE reported.

Conclusion 6. An observation of physiological covariation of cortisol excretion rates for those couples who evidenced an affective relationship was interesting and will be observed in repeated assays within the longitudinal study. (Appendix E).

Conclusion 7. A reported decline in physical activity was not observed to limit the general interenvironmental mobility of those aged who are capable of independent living.

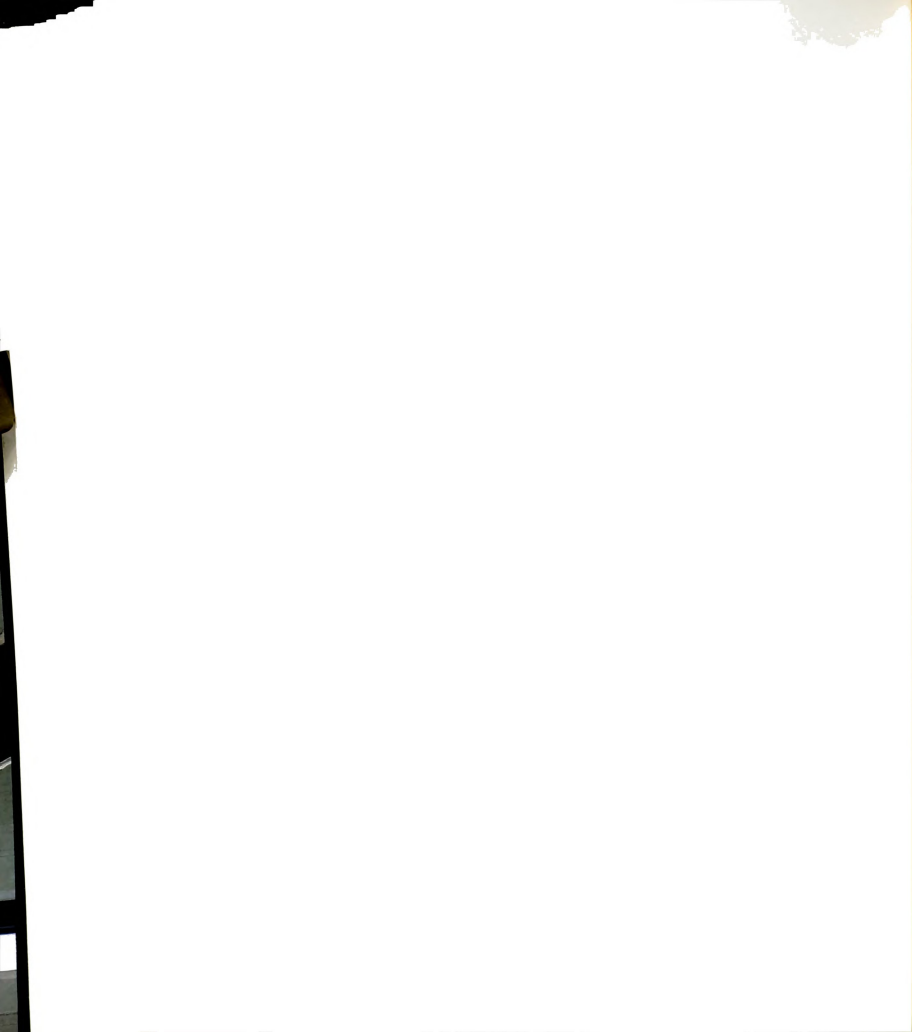
The following discussion relates the conclusions to the history of events observed by the interviewer during the data collection and analysis.

DISCUSSION

The discussion relates to those observations by the interviewer regarding the choice of facility, the anticipated use of the facility, and the anticipation stress both as expressed by the participants and measured by radioimmunoassay of urinary free cortisol. This section concluded with a discussion of the quantitative effects of life changes which accumulate within a short period of time.

All of the applicants to the retirement village are functionally healthy and capable of independent living in spite of the advanced mean age of eighty. Each applicant expressed the desire to choose with some feeling of assurance both where and how they would be cared for in the event of a decline in health.

Because the facility houses an independent, active population, the applicants will be in a comparable, functionally healthy position



for establishing new friendships and creating a history of events with the activities and relationships to be shared. This will be of benefit in developing or enhancing the person's social support system prior to possibly becoming dependent upon care providers in the event of a decline in health status.

If a decline in health results in the need for functional assistance, the resident may transfer to the supportive care unit which is readily accessible to the independent living units by architectural design and administrative policy. Except for needing acute care services of a hospital, the residents will not be required to relocate to another facility or institution in the event of mental and/or physical deterioration.

Relocation is a major life change and only one of several life changes occurring to individuals 70 years of age and older. As has been noted, the anticipatory anxiety as observed by the interviewer was heightened by the unexpected delay in admission to the facility prior to the inclement winter weather of the location. If anticipatory anxiety alone can affect cortisol production rates, then the stress in the movers' sample was expected to show a positive correlation with cortisol levels. Also, the health of the subjects may have contributed to the use of adaptive mechanisms.

If psychological influences are among the most potent natural stimuli known to effect pituitary adrenal cortical activity, then we might expect a higher level of cortisol for those persons who have experienced more life change events and/or who are anticipating a major move. Since anxiety is basically anticipatory, a pre-move elevated

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cortisol would have been consonant with the theory of the relationship of reported anxiety and cortisol elevation. However, anxiety can inhibit and then be displaced after a period of time. In those persons who were both anticipating a move and had reported a high number of life changes, we have observed a statistically significant difference in cortisol response.

The significant finding of the variance in cortisol for those persons anticipating a move who had also reported a high number of life changes may indicate that a stress threshold response has activated the individuals' defense mechanisms and coping styles. It would be of further interest to compare the defense styles with UFC excretion rates to observe if indeed those persons using DENIAL have suppressed their UFC secretion and whether those persons who are clinically depressed are indeed the hypersecretors. Of further interest would be the observation of both short and long-term adjustment to relocation based on this data.

This study would caution against premature judgments of the stress of relocation based solely on the pre-move data. It can safely be stated that individuals appear to respond to stress of major change events in a heterogeneous manner and any interpretation of the cortisol findings should remain within the context of a longitudinal study with repeated measures.

The assessment of LCE during the time of relocation is important for its causal and resultant relationship to the perception of stress and to a variety of attendant illnesses. The life changes are noted for their stress-producing qualities that may alter the context of



the environment in which relocation is occurring. Temporal factors may determine the significance of a given stressor and thus the intensity and extent of the stress state. Selye's notion of a common stress reaction is in question and further studies of relocation should provide good support for the notion of individual responses to a common stimulus.

Lazarus (1977) has expressed concern that psychological research has tended to focus on the immediate stimulus situation that provokes an emotion while overlooking what is or what has happened in the general life of the person. Any situational event also has an attendant history within the context of the person's environment. Consequently, the cognitive processes and coping strategies are a result of at least four dynamic interactions, i.e., the person's history, the particular personality, the actual occurrence of the event, and the perception of the event within the environmental context. Apply and Trumbull (1965) had observed earlier that the response patterns which occur in stressful situations have intra-individual consistency but varied in inter-individual psychobiological response.

In this study, the variance of cortisol response for those persons who were anticipating imminent relocation and who had also experienced a high number of life change events is statistically significant. During the process of coping with an event, the individual is also constantly reappraising his relationship with the environment and

it becomes apparent that the response to an event is predictable only within the context of the four dynamic interactions noted earlier.

The last section, RECOMMENDATIONS, is divided into two parts. The first part presents those implications for further research. The second part applies those conclusions stated in this chapter to a rationale for housing policy implications for the aged.

RECOMMENDATIONS

IMPLICATIONS FOR FURTHER RESEARCH

The lack of consensus about which characteristics are most indicative of successful adjustment in relocation became apparent in Chapter II, entitled, Review of Related Literature. Studies of adaptive response to situational stress must focus on the total context of the person within the environment through a longitudinal research design that ranges from one situational context to another. Although cumbersome and rigorous, the repeated observations in a longitudinal design would evidence a life history and coping style within a given environment, since the response of individuals to environmental and situational stressors is not apart from the life history. This field or naturalistic approach to research poses several experimental design concerns; however, the information would be useful in a developmental paradigm as the best predictive model for assessing situational stress.

The recommendations for additional research which relate to this study are listed as follows:



1. Assay repeated measures of cortisol during and after relocation to determine variability of cortisol excretion during a physical and psychological stress event for given individuals.
2. Assess clinical health status prior to and one year following relocation; compare defense style with UFC.
3. Note relationship of cortisol excretion rates to progress of existing chronic diseases.
4. Compare cortisol levels and perceived environmental congruence following relocation.
5. Compare self-report of anxiety/depression with pre- and post-move cortisol levels, perceived environmental congruence and progressive health status.

Another study of academic interest would be the observation of the affective relationship of couples and the physiological covariation of urinary free cortisol.

The last recommendation for further study is the implementation of an experimental design in an animal laboratory for measuring the response of aged animals to being isolated from their social group and placed in an existing cohesive group. The determination of group cohesion would result from observations of social behavior and measurement of cortisol excretion rates.

RECOMMENDATIONS RELATED TO POLICIES FOR HOUSING THE AGED

An appropriately designed and administered housing facility can maintain the desirable independent living for the active aged while providing an accommodating environment as service needs increase. It is feared that too-easily available services may undermine independence,

and while this point is well taken, many elderly who are active and independent desire the choice of housekeeping services and the availability of meals on a regular basis. (Brody, 1979)

In a study of housing for the aged, Lawton, Greenbaum, and Liebowitz (1980) have described two models which they identify as the constant model and the accommodating model. In the constant model the policy of the administration is to preserve the original characteristics of the residents through replacement. Therefore, as the person's needs for service increase with the associated functional decline, a move to another facility becomes inevitable. The rationale for a constant model is to preserve the community image of housing the active, energetic elderly in hopes of replacement with persons of like characteristics. Unfortunately, the forced displacement occurs during a period of decline when a person may have fewer reserves for re-establishing a social support system and is thereby forced into a greater degree of independence.

The accommodating environment, such as the one described in this study, provides for independent living and supports this image with policies which encourage health behavior. Residents may subscribe to housekeeping and food services as desired or meals may be prepared within their living units. However, codes of dress and physical function help maintain an atmosphere within the main dining room that is conducive to sharing with family and other guests. As the need for supportive care becomes apparent, the resident will move into those units within the same structure which provide increased services but allows the resident to maintain contact with the spouse and/or friends. However, those persons who require mechanical aids for mobility or who need assistance with meals are required to eat in the supportive care dining room.



The recommendations which apply those conclusions from this study to the rationale for housing policy for the aged follow:

1. Provide opportunity for continued mobility and new experiences which may stimulate that sense of wonder
2. Encourage family to maintain frequent contact with residents and participate in on-going family activities
3. Provide supportive and comprehensive health care units within the retirement village to avoid the institutionalization and alienation from their existing social support system which was established during a period of independence
4. Encourage health behavior through policies which support or reward independent living and functional health.

In summary, this study has observed that major life changes for the aged result in a loss of social support and are accompanied with other changes in life style. As the number of changes increases, the coping styles give evidence of an individualized response. With the increased need for housing the aged, the development of more accommodating environment models to attract the healthy, vigorous aged resident would enable individuals to expand or establish a social support system during a period of independent living with the choice of remaining within the environment during the years of decline.

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APPENDICES



Appendix A
Life Change Events Inventory



Appendix A

SCHEDULE OF LIFE CHANGE EVENTS

TIME FRAME

LIFE CHANGE EVENT	< 1 year			< 2	< 3
	1	1 < 6	6 < 12	1 < 2	2 < 3
1. DEATH OF SPOUSE	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
2. DEATH OF CLOSE FAMILY MEMBER	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
3. DEATH OF CLOSE FRIEND(S)	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
4. MARITAL PROBLEMS	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
5. CHANGE IN NUMBER OF ARGUMENTS WITH SPOUSE	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
6. DIVORCE	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
7. MARITAL SEPARATION	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
8. SEX DIFFICULTIES	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
9. MARITAL RECONCILIATION	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
10. MARRIAGE, BEGINNING TO LIVE WITH SOMEONE	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.

11. IN-LAW TROUBLES	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
12. TROUBLE WITH CLOSE FRIEND(S)	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
13. SON OR DAUGHTER LEAVING HOME	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
14. CHANGE IN FAMILY SITUATION OF CHILDREN	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
15. GAIN NEW FAMILY MEMBER	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
16. CHANGE IN HEALTH OR BEHAVIOR OF SPOUSE	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
17. CHANGE IN HEALTH OR BEHAVIOR OF CLOSE FRIEND	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
18. CHANGE IN HEALTH OR BEHAVIOR OF FAMILY MEMBER	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
19. PERSONAL INJURY OR ILLNESS	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
20. RETIREMENT	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
21. SPOUSE BEGAN OR STOPPED WORK	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
22. BEGAN NEW JOB	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
23. CHANGE IN WORK HOURS OR CONDITIONS	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.

24. OUTSTANDING PERSONAL ACHIEVEMENT	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
25. CHANGE IN RESPONSIBILITIES AT WORK	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
26. CHANGE IN RESIDENCE	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
27. CHANGE IN LIVING CONDITIONS	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
28. CHANGE IN RECREATION	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
29. CHANGE IN SOCIAL ACTIVITIES	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
30. CHANGE IN CHURCH ACTIVITIES	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
31. CHANGE IN NUMBER OF FAMILY GET-TOGETHERS	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
32. CHANGE IN PERSONAL HABITS	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
33. CHANGE IN EATING HABITS	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
34. CHANGE IN SLEEPING HABITS	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
35. CHANGE IN PHYSICAL ACTIVITY	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
36. VACATION: LONG TRIP	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.

37. CHRISTMAS/HOLIDAYS	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
38. CHANGE IN FINANCIAL STATE	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
39. BUSINESS READJUSTMENT	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
40. MORTGAGE OVER \$10,000	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
41. FORECLOSURE ON LOAN OR MORTGAGE	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
42. MINOR VIOLATION OF THE LAW	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.
43. MAJOR VIOLATION OF THE LAW	ONE WK.	ONE MO.	SIX MOS.	ONE YR.	TWO YRS.

Appendix B
Life Change Events As Factored



Appendix B

Life Change Events As Factored

SOCIAL SUPPORT

1. Death of Spouse
2. Death of Close Family Member
3. Death of Close Friend(s)
10. Marriage, Beginning to Live with Someone
12. Trouble with Close Friend(s)
13. Son or Daughter Leaving Home
14. Change in Family Situation of Children
16. Change in Health or Behavior of Spouse
17. Change in Health or Behavior of Close Friend
18. Change in Health or Behavior of Family Member
31. Change in Number of Family Get-Togethers

LIFE STYLE

19. Personal Injury or Illness
20. Retirement
21. Spouse Began or Stopped Work
22. Began New Job
23. Change in Work Hours or Conditions
25. Change in Responsibilities at Work
27. Change in Living Conditions
28. Change in Recreation
29. Change in Social Activities
30. Change in Church Activities
32. Change in Personal Habits
33. Change in Eating Habits
34. Change in Sleeping Habits
35. Change in Physical Activity

EVENTS

15. Gain New Family Member
24. Outstanding Personal Achievement
36. Vacation: Long Trip
37. Christmas/Holidays
38. Change in Financial State
39. Business Readjustment
40. Mortgage Over \$10,000

RELOCATION

26. Change in Residence



Appendix C

Hypothalamo-Pituitary-Adrenocortical Axis Review

The endocrine glands are groups of cells located in various parts of the body and are known to secrete and release highly specific chemical compounds (hormones) into the bloodstream. The actions of the endocrine glands are interrelated and many hormones seem to either oppose or supplement one another. (Shafer et al., 1967)

Cortisol is a major glucocorticoid secreted by the adrenal cortex. The anterior pituitary gland secretes two types of hormones, one acting directly on specific tissues and another--the tropic hormones--regulating the output of hormones from other glands. One of the tropic hormones, adrenocorticotrophic hormone (ACTH), stimulates the secretion of glucocorticoids by the adrenal cortex. (Shafer et al., 1967)

The hypothalamus contains neurones, as neurotransmitters, which have dual effects in the regulation of each hormone secretion. These releasing (excitatory) and inhibiting factors cannot be measured at this time, but the hormones can be measured. (Sachar and Brown, 1980) The neurones which contain the hypothalamic hormones integrate the multiple inputs from three sources, 1) extero stimuli, 2) interoceptive stimuli (emotions), and 3) the neural clocks. (Sachar and Brown, 1980)

The neuro-hormonal link between the hypothalamus and the anterior pituitary gland is the hypothalamo-hypophyseal (pituitary)-portal capillary system. The corticotropin-releasing factor is



responsive to cortisol levels and to stress. (Sachar and Brown, 1980)

The negative feedback system for the secretion and regulation of cortisol is within this hypothalamo-pituitary-adrenocortical axis (HPA). Because the actions of the endocrine glands are interrelated, many hormones seem either to oppose or to supplement one another. For example, insulin lowers the blood sugar, while the glucocorticoids elevate it. During relocation what, then, happens to a person who is diabetic? Another example is the action of tropic hormones that stimulate the production of certain other hormones which, in turn, inhibit production of the tropic hormones. Both the glucocorticoids and aldosterone can regulate sodium balance. Probably no vital function occurs without the interrelated action of at least several hormones. (Shafer et al., 1967)

Stewart Wolf (1970) has stated that life experiences become symbolic stimuli that owe their force to their meaning for a particular individual. It is through the HPA axis that each person processes the meaning and stresses of a life change event, and this includes a relocation.

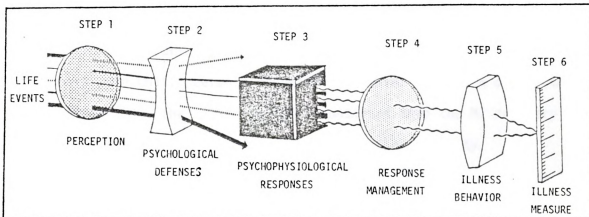


Appendix D
Life Change and Illness Model



APPENDIX D

A LIFE CHANGE AND ILLNESS MODEL



The LIFE CHANGE AND ILLNESS MODEL was developed by Richard Rahe and Ransom Arthur (1978) to illustrate a mental (cognitive) process by which events and their symbolic meaning impact the person and may lead to subsequent illness. The model utilizes a series of optical lenses and filters to represent this process. In thinking of how a life change event could be related to subsequent illness, we, as investigators, need to distinguish causative factors from mechanisms (processes). The causal factors activate the mechanisms which, at one point, may appear as a functional or activity change, while at another point appear as an organic change with structural and tissue damage. (Wolf, 1970).

In Rahe's mode, the person brings to the event a biological



and genetic endowment, early developmental and environmental influences, and a history and conditioning for the event. At step one, the person has altered the objective event with symbolic meaning.

The ego defense mechanisms, shown as step two, are conceived as protecting the individual from threats within the environment. For example, DENIAL is capable of diffracting the impact of a myocardial infarction (MI) during the acute stage when the individual is in a coronary care unit. Defense mechanisms, however, can be a disservice, if, for example, the person's DENIAL continues into the MI recovery phase and results in a disregard for restricting activity.

In studies by Wolff, Friedman, and Hofer (1964), a change in 17-OHCS excretion rates was compared to a clinical assessment of defense mechanisms in parents whose children were dying with leukemia. No increase in 17-OHCS was observed in those parents who evidenced defenses of RATIONALIZATION and INTELLECTUALIZATION. A decrease in 17-OHCS occurred for parents using DENIAL, and an increase was found in those who were judged to be "psychologically undefended."

A mysterious black box depicts step 3 in the model to represent a repertoire of psychophysiological responses. These include functional responses such as increased adrenalin, increased heart rate, elevated serum lipids, pain, muscle tension, stomach cramps, diarrhea, and others. These indicate altered function apart from structural or tissue damage. A change in cortisol excretion rates would be evidenced at this step.

The persistence of psychophysiological reactions can--but will not necessarily--lead to eventual organic dysfunction. Mason (1964) has noted that these psychophysiological responses can be immediate

and/or delayed, uniphasic and/or multiphasic, and even interactive.

In step four, the person becomes aware of symptoms which may be psychological distress and/or physical dysfunction or pain. Coping strategies are activated and a feedback or cybernetic process may be initiated back through step two or step three. The response management depends, to a large extent, on how the individual interprets what is happening. The cognitive strategies associated with coping include MINIMILIZATION, DISTRACTION, AVOIDANCE, and SELECTIVE AWARENESS.

Step five is symbolic of a person focusing attention on a symptom such as a headache and is called "illness behavior". When an individual chooses to report a symptom(s) to a physician, "sick role behavior" may also be adopted, i.e. missing work, going to bed, becoming dependent on the physician. Early studies of life change and illness were, no doubt, confounded by "illness behavior" since the number of visits to "sick bay" were recorded as an objective measure of illness. (Rahe, 1968).

Step six is an objective measure or a measure diagnosis of illness. For example, a blood pressure reading of 180/110, and a diagnosis of hypertension would be a step six observation following a step five complaint of dizziness and "ringing in the ears."

Rahe's model of life change and illness presents the conceptual framework for studying the individual differences in cognitive processing of life changes and how these change events may be associated with subsequent illness. The dissertation, Anticipated Relocation by the Aged: Life Change and Urinary Free Cortisol, is conceptually embodied within this model.



Appendix E

Grant Proposal: Decline of the Aged
Related to Stress of Relocation
(Abstract)



Appendix E

Grant Proposal entitled: Decline in the Aged Related to Stress of Relocation

Submitted to the Department of Health and Human Services, March 1, 1980

ABSTRACT

This exploratory study will seek to determine if the increase in physical disability and deterioration which often follows relocation of functionally healthy, aged populations is associated with perceived environmental support, life change events, and a prior change in the adrenocortical activity as measured by radioimmunoassay of urinary free cortisol.

All participants will enter the study prior to relocation. Five instruments will be administered by a registered nurse during a home visit, and a twenty-four hour urine will be collected. Prior to the move a medical doctor will complete a clinical assessment--history and physical--for each participant and this will be repeated at one year following relocation. Additional observations, including the collection of a twenty-four hour urine, are obtained during five time intervals, i.e. day one or two following the move and again during the first week, and also at two weeks, three months, and one year following relocation.

Population and Sample: The population under investigation represents twenty-five persons 70 years of age and older who are involved in a relocation of habitat. This population is healthy in terms of functional activity but will exhibit chronic diseases characteristic of the aged population at large. The sample will be drawn from applicants to a retirement village in sequence of acceptance on a waiting list. They generally are in good health, of middle to upper socio-economic status, moving by automobile with possessions, and from single unit dwellings in Western Michigan. This is not a random sample, however, and we will carefully observe their demographic characteristics.

A control sample of fifteen subjects will be living independently in their present residence in the Grand Rapids area for two years or longer with no current plans for relocation. They will be matched for age, independent living, functional health, educational and socio-economic background.

Treatment: The treatment is the physical relocation of the subject and accompanying possessions into the retirement facility. Day one will be the day following the first overnight stay by the occupant.

Instrumentation and Data Collection*

Adrenocortical Activity: Six 24-hour urine samples will be collected on all subjects as indicated on the data collection time schedule. The samples will be prepared for freezer storage in aliquots at -70°C . The GammaCoat ^{125}I Cortisol Radioimmunoassay is the commercially available kit selected for the measurement of urinary free cortisol.

Perceived Environmental Support:

1. The Life Change Events and Impact Inventory is a modification of the Holmes and Rahe "Social Readjustment Rating Scale." The face validity of the scaling method has a high correlation on judgments of item intensity between different populations with r values usually over .90; however, the important variable in psychosomatic and psychological research is the cumulative stress from the impact of life events looking at measures of frequency, amount, and clustering of life changes. This instrument contains items of social support to be factored for analysis in perceived environmental support.
2. The Family Apgar as a measure of perceived social/family support is currently used by family practice physicians to identify dysfunctional family situations. This requires self-rating on a three-point scale of the degree of satisfaction with five aspects of family support (help, interest, acceptance, affection, and time involvement). This incompletely tested instrument appears to be a true measure of perceived support, although not a very extensive index.
3. The Environmental Assessment contains objective as well as subjective items. The subjective instrument is specifically designed for clinical use and is currently being tested for empirical findings regarding estimates for reliability and validity.

Disability and Deterioration:

Psychological Stress and Mental Stress

1. The Spielberger State-Trait Anxiety Inventory (STAI) provides operational measures of both state and trait anxiety with normative tables for both psychiatric and non-psychiatric populations. The test-retest reliability and stability of the STAI A-Trait scale is relatively high ranging from .73 to .86; however, stability coefficients for the STAI A-State scale tend to be low, as would be expected for a measure designed to be influenced by situational factors. Both the A-Trait and A-State scales have a high degree of internal consistency.

2. The Carroll Depression Inventory is a self-rating scale developed from the Hamilton Scale as a clinical means for differentiation between mild depression and depressive illness.
3. The Mental Status Questionnaire (MSQ) is a ten item completion questionnaire and has the advantage over other mental status measures in that the examiner can compensate for the subject's deficiencies in language, sensory reception, attention or motivation by mechanisms such as repetition, speaking loudly, translating, and mobilizing the subject's attention for a brief span of time. Independent psychiatric examinations of 328 subjects indicated that only 12 percent of older subjects making no errors or only 1 or 2 errors were certifiable as suffering from mental illness by New York State standards; whereas 78 percent of those making 9 or 10 errors were certifiable. This MSQ is in wide use as an aid to understanding just how much of a subject's exhibited difficulty is attributable to chronic brain syndrome. "Normal" senescence does not result in a lowering of scores on the MSQ, nor do most neurotic conditions. Non-organic psychoses may or may not result in lowered scores, but other indicators can usually determine whether it is a functional psychosis that is impairing performance.

Physical Deterioration and Disability:

1. History/Physical Information. This will be derived from a standard ROCOM Patient Data Base System questionnaire and physical examination form completed by the family physician participating in the project.
2. Activities of Daily Living. This is a graded scale rating functional performance, i.e., bathing, dressing, toiletry, capacity to get into bed, continence, feeding, walking and extent of house confinement. This index reflects the adequacy of a spectrum of organized neurological and locomotor responses and serves as a graded measure of such biological and psycho-social function.
3. Range of Motion. A standardized test of Range of Movement and Strength measuring neuromuscular disability which defines severity of limitations of range of movement and strength in each shoulder, elbow, wrist, fingers, thumb, knee, hip and ankle.
4. Health Status Assessment/Reassessment. These forms provide for an initial rating of disease status to be compared in a blind rating at the one-year follow-up reassessment. The

index for deterioration and disability will employ a semantic differential scale with bipolar adjectives improved/worse to quantify change in health status. A global rating for change in health status will be assessed by the same physician for all subjects. Information about the number of people who might be expected to deteriorate in health and disability without relocation is not available; therefore, the control data will be used for the comparison.

Data Collection Legend

24 hr. Urine Samples - 01 02 03 04 05 06	STAI - 01 05 06
Life Change Events/Impact - 01 05 06	CDI - 01 05 06
Family Apgar - 01 05 06	MSQ - 01 05 06
Environmental Assessment - 01 05 06	Physical Status Assessment - 01 06

Significance

Evidence indicates that the aged respond in a highly individual manner to changes in their environment, and that a dramatic increase in death rate may occur even in seemingly low-risk populations following relocation. This study seeks to identify a measure of adrenocortical activity and perceived environment support as predictors of deterioration and disability related to such relocations. Such predictors may guide the use of measures to prevent subsequent deterioration and disability from happening.

Facilities Available

The activities associated with the study will be conducted through the Colleges of Human Ecology (Department of Human Environment and Design) and Human Medicine (Department of Community Health Science) at Michigan State University, and also, Porter Hills Retirement Village, an extended care facility located in Grand Rapids, Michigan.

The Department of Community Health Science has available a broad inter-disciplinary faculty who can be called upon when needed to provide consultation and assistance. This includes a quantitative services unit which provides sophisticated computer and statistical services.



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