MASTER COPY

A WORKING PAPER

FROM

The Center for Sociological Research

Department of Sociology

STANFORD UNIVERSITY

STANFORD, CALIFORNIA 94305

THE IMPACT OF SELECTED SOCIAL ENVIRONMENTAL AND INDIVIDUAL FACTORS ON STRESS RESPONSES

Valerie C. Montoya
Dorine Barr-Bryan
Kinga Perlaki
Patricia R. Barchas

Program in Sociophysiology

Technical Report No. 84-7 - December, 1984

ACKNOWLEDGEMENTS

This research was supported in part by the Office of Navel Research and in part by the gracious contributions of Edward and Marjorie Grey. The data used in this study were collected using a paradigm designed by Dr. Sally Mendoza while she was a postdoctoral trainee in the Department of Sociology, Stanford University. She is also responsible for Figure 1 as it appears in the appendix. Thanks are due to Paula Taylor who participated in early phases of data collection and data management. Ivan Mefford and Pam Angwin provided helpful consultation regarding the handling of the blood plasma and are responsible for the subsequent analysis. Special thanks are owed to the Stanford Blood Bank personnel for their enthusiastic cooperation and patience during the course of this study.

INTRODUCTION

Over the past few years there has been a rapid development in empirical stress research. Despite varying methods of measurement and conceptualizations of the stress phenomena which have been used in a wide variety of situations, studies provide evidence of a consistently positive relationship between high levels of stress and poor health, both physical (Holahan, 1983; Elliot and Eisdorfer, 1982; House, 1981; LaRocco, 1980; Gore, 1978; and Casell, 1976), and mental (Mitchell and Moos, 1984; Mitchell et al., 1983; Holahan, 1981; Cronkite, 1980; and Meyers, 1972). Yet it is clear that not all individuals react in the same way or degree given what appear to be similar situations. A major unanswered question at this level of inquiry is, "What are major sources of variation among individual responses with respect to stressful events or conditions?" This paper proposes a model using two possible sources: differences in immediate living environments, and the interrelationship of individual and social factors. This paper also considers the following question: "What is the degree to which the stress process varies across different populations such as gender groups?" The extant data set used to explore these questions, consists of cross-sectional measures of physiological and behavioral data collected from college students in a field setting.

STRESS AS A PROCESS

The literature on stress indicates a general consensus that this phenomena should be viewed as a process. Its components consist of the interaction of an environmental event that threatens an individual's existence or well-being and the individual's subsequent response. Known as a stress reaction, this response may express itself physiologically,

psychologically and/or behaviorally. Several factors intervene in this relationship determining both the direction and magnitude of these responses. Social support is one factor that has proven to be influential in this process (see Mitchell et al., 1982 and Elliot and Eisdorfer, 1982 for a review). Yet, the intervening steps between stressors, social support and stress reactions and how they operate have not been clarified. In attempting to explicate this process, we propose a cognitive-physiological model.

This model suggests that variations in perceptions of what is stressful are the key to unlocking individual response differences to a potentially harmful situation. In general terms, the model postulates first that characteristics the individual brings to the situation directly effect their appraisal of that situation. Appraisal of the situation as threatening in turn activates a physiological stress response. However, there are internal and external factors which mediate this response. The first class of variables, antecedent individual characteristics, are represented by self-reported Type-A behavior, and year in school. The appraisal of an event (i.e., level of perceived stress) is indexed with perceptions of competition, academic achievement, and lack of reported student influence in dormitory environments. Internal and external mediators are indexed by level of anxiety in terms of a student's university experience and perceived social support respectively. The model predicts a physiological stress response indexed by plasma norepinephrine levels. In the following sections these variables and their role in the stress process will be elaborated.

ANTECEDENT INDIVIDUAL FACTORS

Type-A behavior, year in school and gender are examples of antecedent individual factors predisposing the individual to respond or experience a stressor in different ways. These factors may directly affect the neuroendocrine systems of individuals, or they may affect the way an individual is likely to interpret an event (i.e., whether the situation is threatening or nonthreatening). According to Lazarus, this appraisal produces "a perception distinguishing the potentially harmful from the potentially beneficial or irrelevant" (Lazarus, 1974:262).

Type-A

Friedman and Rosenman (1974), reported that a group of traits that they called Type-A behavior characterized by highly competitive achievement, strong striving for excellence, a constant sense of time urgency and a tendency to respond with hostility when frustrated, is a risk factor for heart disease. It is believed, "...that it is the repeated physiological mobilization associated with the behavior pattern which leads to the bodily changes that eventually lead to increased risk of coronary disease, and infarction" (Selye, 1980:101). The link between Type-A behavior patterns and physiological responses has been further demonstrated: Individuals who display Type-A responses, when challenged, excrete greater amounts of noradrenaline (Henry and Stephens, 1977), a hormone which affects blood sugar, blood pressure and heart rates (Barchas, 1976:308). Thus, Type-A behavior is expected to have a direct positive effect on plasma norepinephrine.

In addition, work on Type-A behavior patterns suggests that Type-A may involve repression of responses to threatening stmuli. For example, Glass

(1977:181) argues that suppression of subjective states may occur because they interfere with task performance. Therefore, it is hypothesized that the relationship between Type-A behavior and the perception of stress will be negative.

Year in School

The actual level of stress, as well as the perceived level of stress may be affected by an individual's year in school. The university from which our sample is drawn is a large private institution of high academic standards. Seniors perceive more stress in their environment because, while every attempt is made to help freshmen adjust to the university setting, upperclassmen, on the other hand, are expected to have made the necessary adjustments, and are not as steadily supplied with the same stress-reducing resources. Also, they are more likely to perceive competition, lack of structure, and to feel uncertain about the future as they prepare to leave the university setting. Therefore it is expected that there will be a direct positive relationship between year in school and level of perceived stress.

Year in school is also expected to be positively correlated with Type-A behavior. Margolis et al. (1983) provides an excellent discussion of an ecological approach to type-A behavior which includes taking into account interpersonal, institutional, and cultural levels of the environment. The university as an institution in society promotes Type-A behavior to the extent that:

"(1) its reward systems foster aggressive competition and achievement striving;

(2) there is limited controllability and/or predictability of success or failure, accompanied by little tolerance for error;

(3) there are numerous role demands, resulting in both time and opportunity conflicts; and

(4) there are time demands that encourage time-urgent and/or aggressive behavior." (p. 252)

Therefore, rather than just concentrating on the components of Type-A behavior at the level of the individual, it is important to view type-A behavior from an ecological perspective, with attention directed at several levels of the environment.

Gender

The stress process will vary across populations. Some populations may be more at risk to stressful events/conditions or there may be differential access to resources or differences in social roles. For example, there is evidence that stress as a process operates differently for females than for males (Cronkite et al., 1984; Billings and Moos, 1982a and b; Blascovich, 1981; and Rosenfield, 1980). This may be due to differences in sex roles. Frankenhaueser (1978) showed that a sample of women who had nontraditional female roles displayed neuroendocrine patterns more similar to males than to more traditional females. Because there are differences, this model is tested separately for both females and males. In sum, there are three variables which serve as antecedent individual factors in the stress process: Type-A responses, year in school, and sex.

ANTECEDENT ENVIRONMENTAL FACTORS

Not only should the characteristics of individuals be considered, but attention must also be directed towards the immediate social context within which the individual resides or functions (Baum, 1981; Moos, 1973).

Structural constraints may limit an individual's access to social support networks. For example, a hierarchy of social roles will prevent a low-ranking member from seeking social support from a high ranking person or the topic of conversation may be constrained by social norms. The immediate social context also varies in the degree to which it places individuals at risk in terms of stressful events or conditions. In a university setting, residential units or dormitories which, overall, rank high on social support will have individuals who on the average score lower on perceived stress, university anxiety, and norepinephrine (Moos and Van Dort, 1979; Kiritz and Moos, 1974; Moos and Gerst, 1974; Moos, Smail and DeYoung, 1974; and Gerst and Moos, 1972).

PERCEIVED STRESS

In this study, factors in a person's immediate environment were used as measures of perceived stress. These factors include competition, academic achievement and lack of student influence. The selection of these factors is based on evidence that they are major determinants of the stressfulness of the person-environment exchange. As indicated in general by their link to negative health outcomes, negative affect and increases in stress hormones.

Gerst and Sweetwood (1973) used the University Residence Environment Scale (URES), the same instrument used in this study (Moos and Gerst, 1974). They were interested in demonstrating a relationship of social climate dimensions to individual behaviors. They found a consistent pattern among certain dimensions and negative affect. Individuals who score high on competition, academic achievement, or low on student influence tended to express greater feelings of anxiety, depression and hostility.

In another study, Moos and Van Dort (1979), related student physical symptoms to the social climate of university living groups. They found that living groups characterized by high student physical symptoms were perceived by students as low in involvement and support, high in competition, and low in student influence. Students felt that it was difficult to approach the house staff, that they had little influence on the rules, policies, and operation of the house. These students also felt that they were in a somewhat competitive environment.

Also, psychobiological stress research shows that the ability to exercise control over one's own activities can lower stress reactions. This is based on the assumption that "a person who is in a position to regulate stimulus input may be able to maintain both physiological arousal and psychological involvement at an optimal level over a wide range of stimulus conditions" (Frankenhaeuser, 1978:133-134). Frankenhaeuser discussed several studies which demonstrated this relationship. In particular she discussed human experiments which tested for the impact of control over noise intensity on stress responses. Subjects were asked to perform mental arithmetic under noise exposure, every other subject was offered a choice in noise intensities; however, the next subject had to submit to the level that was chosen by the preceding subject. Among these latter subjects those who perceived that their locus of control was internal, tended to have smaller increases in neuroendocrine responses when they exerted control over noise intensity than when they did not, whereas for "externals" the pattern was reversed.

Initially we had thought the blood donation itself could serve as the potentially harmful event. However, this was true only for subjects donating blood the first time, and there were too few of them for a

complete analysis to test the model. However, there is a positive correlation between how anxious an individual was while donating blood and how much stress an individual perceived in his immediate environment. For these subjects, perhaps blood donation served as an activator or priming agent, sensitizing or leading a person to perceive greater levels of stress.

INTERNAL AND EXTERNAL MEDIATORS

What happens once an individual appraises an event as threatening? This appraisal may or may not be reflected in an individual's physiological response (i.e., heightened levels of norepinephrine). Rather there are both internal and external factors that modify that response.

Internal-Anxiety/Coping. Internal mediators include tendencies in individuals to respond or cope with a stressful event/situation in a more or less effective way. Individuals decide which adapting mode is most suitable. In our study, general success at coping was indexed by university anxiety scores (Zuckerman, 1960). Zuckerman argues that the Affect Adjective Checklist (AACL) is useful as a "quick" measure of general anxiety, and goes on to add that the "time set" of the AACL may be changed by simply altering the instructions. In the questionnaire provided to each subject in our study, subjects were asked to, "check all the words below which generally describe how you feel about your overall college experience where you are currently attending school," changing the AACL into a situation specific instrument. This anxiety score was used to measure success at coping under the assumption that the less anxious persons were the most successful copers in this particular university situation. However, there is a problem with the measure. If

an individual scores low on the scale, it may mean that they were successful at coping or that they never perceived any threat.

External-Perceived Social Support. Social conditions also act as external mediators in the stress process at another level.

> "The individual faced with threat, for example, takes note of these circumstances and social values in choosing a coping response because his response may have important consequences for his welfare, over and above the original threat. Moreover, some of these values and codes on conduct have also been internalized by him, and thus shape his appraisals as aspects of his personality" (Lazarus, 1974:285)

Social support is an external factor which will be focused on. Thoits (1982) defined social support "as the degree to which a person's basic social needs are gratified through interaction with others. Basic needs include affection, esteem or approval, belonging, identity, and security" (p. 147). In a critique of the concept "social support" as it is used in stress research, she points out that few have attempted to develop valid or reliable indicators of the concept. There are several aspects which must be considered: 1) the amount or degree of social support; and d) the structure of social support (i.e., size, density, accessibility and reliability). Our measure of social support takes into account most of these aspects including: the amount of interaction as well as both types of social support. Unfortunately, we did not have available to us measures of social support from sources other than the dormitory.

Social support, as an external mediator, is expected to have an effect on the physiological stress response through several potential routes. Perceived social support is expected to have direct, indirect, and buffering effects on an individual's response:

(1) Direct Effects of Social Support. Does social support have an effect on a person regardless of whether or not that person is under

stress? This may occur, for example, because social support has a tranquilizing effect on the neuroendocrine system (Bovard, 1959; Casel, 1976). Longitudinal studies provide evidence of a direct link between social support and various indices of physiological and psychological functioning (Mitchell, 1982). Norepinephrine is one of the stress hormones. The model therefore hypothesizes that there will be a direct negative effect of social support on norepinephrine.

(2) Indirect Effects of Social Support. Social support indirectly effects levels of functioning because it may alter the perception of an event, causing individuals to perceive an event as being less threatening or it may reduce the importance of this perception to individuals and hence their degree of reaction to it. Therefore a negative relationship between perceived social support and perceived stress is expected. Alternatively, or jointly, it may be that supportive others may facilitate healthful behavior (LaRocco, House, and French 1980; Mitchell, 1982). For example, social support may encourage more effective means of coping. As a result, the link between perceived social support and anxiety is expected to be negative.

(3) Buffering Effects of Social Support. What is the relationship between both types of mediators (i.e., perceived social support and success at coping/university anxiety)? The first buffering hypothesis asks whether or not there is an interaction between perceived stress and perceived social support on university anxiety. In other words, will individuals experiencing both high social support and high levels of stress, be more successful at coping. The second buffering hypothesis asks whether or not once some sort of coping has occurred, does social support interact with any anxiety that remains, to buffer an individual's

subsequent response to stress (lowering the release of norepinephrine). In other words, is social support most effective as a moderator when an individual continues to experience high levels of anxiety?

PHYSIOLOGICAL RESPONSE

Norepinephrine. In this study, norepinephrine, one of the catecholamines, was the hormone available as an indicator of an individual's physiological response to a stressful situation. The release of catecholamines from the adrenal medulla into the circulation system is a response elicited by a wide variety of stimuli (Kopin, 1980; Sacher, 1980; Barchas et al., 1978; Frankenhaeuser, 1978; and Mason, 1968).

Mason (1968) reviewed several studies which showed a link between elevations of norepineprhine and athletic competition. One study he reviewed found that, "Catecholamine elevations before as well as after competition indicated that psychological factors were major determinants of the endocrine response" (Mason, 1968:634). He also discussed another study in which researchers found, "increased urinary norepinphrine and VMA excretion on work days in a group of men exhibiting excessive competitive drive, aggressiveness, and an enhanced sense of time urgency--a behavioral pattern found to be often associated with coronary artery disease" (Mason, 1968:636). He suggests that this supports the notion that active aggressive emotional states are related to increased excretion of more epinephrine; whereas tense, anxious, but passive emotional states are related to increased epinephrine excretion. Given that our stressor is a combination of competition, academic achievement and a lack of student influence, the use of norepinephrine as an indicator of stress seems appropriate for this exploratory study.

In sum, physiological stress reactions are expected to be determined by the interrelationship of individual characteristics as well as situational influences. These factors include: the immediate environment in which the individual resides; predisposing individual factors; attitudes towards the stressor; the individual's perceived level of social support which may be viewed as an adaptive resource that facilitates coping; and how successful an individual was at coping with a stressful event or condition.

METHOD

Subjects

Subjects were recruited from volunteer donors to the university blood bank during blood drives which took place within each dorm. Four university residences were chosen for analysis. From these a total of 185 undergraduate students were recruited in the spring. Overall there were 98 males and 87 females. One-hundred-twenty-one of the total 185 had donated blood previously. A majority (n=126) of the students recruited were freshmen. The age range was from 17 through 24, with 18 being the modal age. The following is a more detailed distribution of the sample:

DORM A		DORM C	
male	26	male	31
female	22	female	17

DORM B		DORM D	
male	16	male	25
female	25	female	23

Description of Dormitories

Dorm A. This is a freshman dormitory. There is a total of 179 students (82 males, 88 females). One-hundred-sixty-nine of these students are freshmen. There is a staff of 9.

Dorm B. This housing unit is composed of seven houses, each with 50 to 80 residents. Three of these are all-freshmen houses, the others are four-class, coeducational houses. Most residents live in double rooms, although there are a few singles and triples. All houses are coeducational, with men and women living on the same corridors. Each house has an individual dining room, but shares a cafeteria line with two or three adjacent houses. All houses have a lounge, kitchenette, study room, piano, and television. In addition, the administrative building contains a lounge, a conference room and guest rooms. There is a total resident population of 450 (209 males and 220 females). There are 256 freshmen (122 males and 134 females). There is a staff of 21.

Dorm C. This dormitory houses 292 students and is the largest single dormitory on campus. It is a four-class coeducational residence and contains both single-sex and coeducational corridors. Most upperclass residents live in three-room triples or in singles, although a few double rooms are available. Residents take their meals in one of two dining rooms, both with cafeteria service. Facilities include a large main lounge; a smaller, more intimate lounge with a grand piano; a library which opens onto a sundeck; a well-equipped darkroom; a kitchen; a laundry; a computer terminal; and recreation rooms with color television, pool table, and ping-pong table. There are 136 males and 144 females. Eighty-seven of the students are freshmen (33 males and 54 females). There is a staff of 12.

Dorm D. Six houses comprise this dormitory. Four houses are four-class, the other two are all-freshmen houses. All houses are coeducational with men and women living on the same corridors in some houses and on separate floors in others. Almost all residents live in double rooms. Every house has its own dining room and cafeteria line, a large lounge with a fireplace and stereo, a kitchenette, and a piano. Most residents have access to a house library and ping-pong and pool tables. One house has a darkroom and an art studio and silk-screening room. There are a total of 613 students (352 males 240 females). Of these, 356 were freshmen (204 males, 152 females). There is a staff of 21.

Procedure

Experimenters helped recruit volunteers in exchange for participation in the blood drives. The time of day the blood drives occurred varies:

DORM A: 2:00 p.m. - 7:30 p.m.

DORM B: 11:07 a.m. - 3:00 p.m.

DORM C: 2:00 p.m. - 7:30 p.m.

DORM D: 4:00 p.m. - 8:00 p.m.

At the blood donation site, subjects were greeted by an experimenter who recorded their time of arrival. They were asked whether or not they would like to participate in the study. The study was briefly explained to them. If they agreed to participate, they were assigned a number. From this station, the next step was the initial interview conducted by a blood bank employee. At this point administrative details were taken care of pertinent to the blood bank personnel such as recording names, type of blood, and checking appointments. The subjects then had their medical histories taken by blood bank personnel to determine eligibility for the

actual blood donation. There was an experimenter at this station who recorded what time the medical history was taken. From there the subject went into the actual blood donation area which contained on the average four cots (Figure 1).

Figure 1 About Here

Another experimenter was stationed here to record the time at which the actual donation started as well as the time in which the prechilled test tubes were filled with a 25 ml sample of blood. Once the tubes were filled they underwent immediate centrifugation and plasma extraction. (The equipment used at this stage was in a separate room out of the view of the subjects.) Once the plasma was divided, the storage tubes were placed on dry ice and frozen for later analysis.

When the subjects completed the actual donation, they were directed toward a post-donation waiting area, where they were required by law to wait 15 minutes. Cookies, juice and coffee were provided by the blood bank. While waiting, the subjects were asked to fill out a two-part questionnaire. Once the questionnaire was completed, any questions the subject had regarding the study were answered. Due to the limitations of space, only those parts of the questionnaire directly relevant to the proposed model will be discussed. (For a more detailed description of procedures and the questionnaire, see Barr-Bryan, Montoya, and Barchas, 1984).

MODEL

Figure 2 provides a model of the interrelationships posited to exist among factors associated with physiological stress responses (indexed by

levels of norepinephrine). This model includes the following variables: Type-A behavior patterns (X_1), year in school (X_2), perceived social stress (X_3), university anxiety (X_4), perceived social support (X_5), and the time of day the blood sample was taken (X_6). The first two variables are measures of predisposing factors in an individual. University anxiety (X_4), and social support (X_5), are measures of factors that may serve as internal and external mediators, respectively, in the stress process. The last variable is included in order to control for circadian rhythms, which influence the release of norepinephrine.

Figure 2 about Here

DATA DESCRIPTION

Individual Characteristics. a) Type-A behavior was measured using a form of self-reported Type-A personality assessment. Subjects were asked to, "Please indicate how true each of the following statements are of you. Answer as quickly as you can, it's your first impressions that are most important." The scales ranged from (very untrue of me) to 6 (very true of me). A composite Type-A score (0-30) was derived by summing the values of these responses. The questions included the following:

1. Sometimes I feel I shouldn't be working so hard, but something drives me on.
2. I thrive on challenging situations, the more challenges, the better.
3. In comparison to most people I know, I'm very involved in my work.
4. It seems as if I need thirty hours a day to finish all the things I'm faced with.
5. I've often been asked to be an officer of some group or groups.

b) Year in school, subjects were asked to indicate whether they were a (1) freshman; (2) sophomore; (3) junior; or, (4) senior.

c) Gender, scores for males and female subjects were aggregated separately.

Stress. The variable used to measure the level of perceived stress in an individual is a composite score consisting of three subscales in the URES (Moos and Gerst, 1974). Two of the subscales are under the Intelligence Growth Dimension (Gerst and Sweetwood, 1973). This dimension measures the degree to which an emphasis is placed on academic and intellectual activities related to the "cognitive development" of residents. The scales under this dimension are competition and academic achievement. The other subscale is under the system change and maintenance dimension.

(1) Competition--the degree to which a wide variety of activities such as dating, grades, etc., are cast into a competitive framework.

(2) Academic Achievement--the extent to which strictly classroom accomplishments and concerns are prominent in the house.

(3) Student Influence--(This scale was recoded in order to make it consistent with the other scales in the index.) The scale measures the extent to which student residents (not staff or administration) perceive they have little control over the running of the house; formulate and enforce rules, control use of the money, selection of staff, food, roommates, policies, etc.

Individual scores for each subscale were standardized (using the raw score conversion tables in Moos and Gerst, 1974). The scores for each scale were then summed, and an average was taken.

Anxiety/Coping. Zuckerman's (1960) Affect Adjective Checklist (AACL) for the measurement of anxiety was used to determine whether or not an individual was experiencing anxiety due to his/her general college experience. Anxiety-plus words were scored 1 if checked and anxiety-

minus words were scored 1 if not checked. This scale provides a method of scoring anxiety which differentiates between high (21) and low (0) anxiety for individuals/groups.

Social Support. The variable used to measure the level of perceived social support is a composite score consisting of two subscales in the URES (Moos and Gerst, 1974). These two subscales fall along the Interpersonal Relationship dimension, which measures the extent to which there is an emphasis on interpersonal relationships in the house. One subscale, involvement, measures the degree of commitment to the house and residents; and the amount of social interaction and feeling of friendship in the house. The second scale, emotional support, measures the extent of manifest concern for others in the house; efforts to aid one another with academic and personal problems; and the amount of emphasis on open and honest communication. The scores from each scale were standardized (using a raw score conversion table in Moos and Gerst (1974). The standardized scores for each subscale were summed, then the average score was taken as an indicator of social support.

Physiological Response. Plasma norepinephrine was available for use as an indicator of the physiological stress response. The collection of plasma was discussed previously. Norepinephrine was measured by high performance liquid chromatography with electrochemical detection. For a detailed description of the method used to analyze the hormone, see Mefford et al. (1981) and Angwin and Barchas (1982). Also, in order to control for the effect that circadian rhythms had on individual neuroendocrine systems, it was necessary to control for the time of day the sample was taken. Specifically, the exact time at which our extracted blood sample was used.

ANALYSIS AND RESULTS

Due to the small sample size, it was not possible to run regressions controlling for the dormitory of each individual. Rather, the Kruskal-Wallis one-way analysis of variance by ranks was used to determine whether there were significant dormitory differences in terms of each of the variables: social support, perceived stress, university anxiety, and norepineprhine. A comparison of means was used to discuss whether or not the immediate social context of the dormitory does in fact have an effect on individuals.

Secondly, regression analysis was used to examine the stress process. The model illustrated in Figure 2 can be represented by the following set of equations:

$$X_3 = \beta_{31}X_1 + \beta_{32}X_2 + \beta_{35}X_5 + e$$

$$X_4 = \beta_{43}X_3 + \beta_{45}X_5 + \beta_{43.5}X_3X_5 + u$$

$$X_7 = \beta_{76}X_6 + \beta_{74}X_4 + \beta_{75}X_5 + \beta_{74.5}X_4X_5 + v$$

Where X_1 = Type-A, X_2 = Year in school, X_3 = Level of perceived stress, X_4 = Level of university anxiety/coping, X_5 = Social support, X_6 = Time of day the sample was taken, X_7 = Norepinephrine, and e, u, and v are random error terms.

Deviation-score regression analysis (Finney et al., 1984), was used to estimate the model illustrated in Figure 2. Finney et al. have shown that the difficulties that arise in interpreting regression analysis in which interaction terms are significant (or in which an a priori argument can be made for their existence), can be averted by creating new interaction terms. In this case, the terms consist of scores derived from deviations from the mean.

Since the model is recursive (i.e., no feedback), ordinary least squares was used as a method of estimation. Pearson correlations were

used to test for problems of multicollinearity. Correlations were performed separately for males and for females. As Tables 2 and 3 show, there were no problems of multicollinearity. The assumptions regarding the residuals were tested for and met. That is, the error terms were normally distributed; they displayed equal variance; the error terms from each equation were uncorrelated; and each of the error terms were uncorrelated with any other predetermined variables in the equation.

Three sets of results will be discussed: (1) The effect of the immediate social environment (the dormitory) on individuals; (2) The relationship of antecedent individual factors and internal/external mediators on stress; and (3) The effect of antecedent individual factors, and internal/external mediating factors on the physiological response to stress (norepinephrine). The .10 level of significance was chosen. Within the last two sets of data, comparisons will be made between males and females.

Immediate Social Environment

There were significant dormitory differences in levels of social support, stress, and norepineprhine (Table 4). Dorm A ranks the highest in terms of social support (mean rank = 108.25), and has the lowest mean level of stress, and second lowest mean university anxiety and norepinephrine level. There is not a clear pattern for Dorm C which ranks the lowest in terms of social support (mean rank = 68.78); however, the pattern is similar to what was expected. It has the third highest mean level of stress, but has the highest mean level of norepinephrine. Thus, it would appear that the immediate social environment, has an effect on individuals within that environment. (When sex is controlled for, the pattern remains similar).

Effects on Perceived Stress

According to the proposed model Type-A behavior as an antecedent individual factor, was expected to have a negative effect on the degree to which an individual perceived stress. This variable proved to be involved in the process yet not always in the expected direction. The first row of Table 5 indicates that among females this pattern is manifested but remains weak (B = -.05, n.s.). However, there is a stronger pattern in the opposite direction for males (B = .22, n.s.). Males who scored high on Type-A behavior did in fact perceive greater levels of stress.

Year in school is another factor expected to have an effect on perceived stress. Upperclassmen were expected to perceive greater levels of stress and in fact this pattern is shown in both sexes. As row two of Table 5 indicates, the pattern is much stronger for females (B = .35, $p<.05$) than for males (B = .09, $p<.1$).

The last variable expected to have an effect on perceived level of stress is perceived social support. We have argued that if an individual perceives high levels of social support, they will be less likely to appraise a situation as being stressful. The third row of Table 5 indicates that this pattern is shown in both males and females to some extent, although the relationship is weak for both sexes. These three variables (Type-A behavior, year in school, and perceived social support), as a set, are more successful at explaining the variation in the perception of stress for females (Adjusted R^2 = .09) than for males (Adjusted R^2 = .05).

Effects on University Anxiety

The proposed model (Figure 2) indicates that we expected perceived stress to have a positive relationship with university anxiety. As the fourth row of Table 6 indicates, this pattern is shown for both males (B = .08, n.s.) and females (B = .34, $p<.05$). Individuals who live in a situation in which they perceived greater levels of stress were more likely to state they felt greater anxiety about their univeristy experience. This pattern is much stronger for females than for males.

Given that we thought there would be a direct link between perceived stress and university anxiety, we also argued that this relationship might be mediated by the level of perceived social support an individual is experiencing. Therefore, social support should have a direct negative effect on university anxiety. As the third row of Table 6 indicates, this pattern is shown in both males (B = -.05, n.s.) and females (B = -.15, n.s.). Athough the relationship is weak for both sexes, it is stronger for females. Individuals who perceived higher levels of social support in their living situation tended to report that they were experiencing lower levels of anxiety.

It was also predicted that perceived social support would have a buffering effect on university anxiety. That is, social support would be most effective as a mediator in the stress process when an individual was experiencing a high level of perceived stress. This was tested for using an interaction term in which perceived stress interacts with social support. As row five of Table 6 indicated, social support tends to have a buffering effect for females (B = -.11, n.s.), although the pattern is weak. This set of variables (Type-A behavior, year in school, and social support) explains eight percent of the variation in university anxiety

among females but does not adequately explain variation in males (Adjusted R^2 = -.04, n.s.).

Effects on Norepinephrine

Type-A behavior was expected to have a direct positive effect on norepinephrine. This was not supported, in fact, there was a negative relationship for both males and females. Specifically, individuals who scored high on type-A behavior, were more likely to excrete lower levels of norepinprhine. As the first row of Table 6 shows, the effect was slightly stronger for females (B = -.29, $p<.1$) than for males (B = -.23, $p<.1$). Thus Type-A was involved in the process, although not in the same way as was expected.

University anxiety is a second factor that was expected to have a direct effect on the level of norepinephrine. It was hypothesized that there would be a positive relationship, i.e., individuals who were more likely to state they were experiencing higher levels of anxiety, would also be likely to excrete more norepineprhine. This hypothesis was not supported, for either sex: Rather, there is a tendency for a negative relationship although it is a weak pattern for both males (B = -.13, n.s.) and females (B = -.08, n.s.).

A third factor that was expected to have a direct effect was perceived social support. It was hypothesized that individuals who perceived greater levels of social support in their living situation would be less likely to excrete higher levels of norepinephrine. Analysis for both males and females did not support this. In fact, there was a tendency for a positive relationship between these two variables; although the pattern is weak for both sexes (males B = .16, n.s. and females B = .12, n.s.).

Finally, it was hypothesized that social support would interact with university anxiety to reduce the excretion of norepinephrine. That is, social support would have a strong positive effect when individuals described themselves as experiencing higher levels of university anxiety. As the eighth row of Table 7 indicates, this buffering hypothesis was supported for males, although it is weak (B = -.04 n.s.), but not for females. In fact, females showed a tendency in the opposite direction (B = .29, n.s.). Rather, there appears to be a stress-intensifying effect. The variables in this last equation explained twelve percent (R^2) of the variation in levels of norepinephrine for males and twenty-four percent (R_2) of the variation for females.

DISCUSSION

The present study was designed as an initial attempt to identify in a human population how the physiological response to stress might be modified by immediate social circumstances, social perceptions and past social experience. We have considered the role of several social factors in the stress process, both at the individual level as well as at the environmental level. Specifically, we asked whether or not the immediate social environment of the dormitory has an effect on individual stress responses. We also developed a model in which we considered: (1) The role of antecedent individual factors on the appraisal or perception of a "stressful situation;" and, (2) the role of these same factors along with perceived stress and social support on subsequent stress responses. Finally, we estimated this model separately for males and females in order to test for possible sex differences. Although not all of our hypotheses were supported by the results, much information was gained.

The results indicate that the immediate social environment within which a person resides or functions does have an effect on their responses to stressful events or situations. Moos' URES provided an effective means of differentiating the dormitories. Individuals who resided in the dormitory which ranked highest in the amount of social support provided to residents were less likely to have excreted higher levels of norepinephrine. This was not true for residents of the dormitory ranking lowest in social support.

We hypothesized that Type-A behavior would be negatively related to the perception of stress. This pattern was found among females but not males. There was a strong positive relationship for males. Also, the other antecedent factor, year in school, had a stronger positive effect on perceived stress for females than males.

Controlling for these antecedent factors, we expected there to be a negative relationship between perceived stress and level of anxiety. This pattern was found among both males and females. There was also evidence that this relationship might be mediated by the role of social support. Social support had a weak, but nevertheless, direct negative effect on university anxiety for both males and females. It also appears to have a weak buffering effect for females but not for males.

Type-A behavior had a significant direct negative relationship with norepinephrine for both sexes. This was not expected. Perhaps this result occurred because high Type-A individuals do not view living in a dormitory which emphasized competition, academic achievement, and which has a lack of student influence as being a stressful situation.

University anxiety was hypothesized to have a positive relationship with norepinephrine. In fact, this was not the case for either males or

females. Perhaps, the distinction that Mason (1974), made is correct. That is, the increase in epinephrine and norepinephrine is elicited under different conditions. He suggested that norepinephrine levels increase when an individual has feelings of aggressiveness while epinephrine is excreted in greater quantities when an individual is feeling anxious, but is being passive. Unfortunately, the data set we used in our analysis did not have a measure of aggressiveness, and there were too many missing cases for epinephrine to serve as a dependent variable.

Finally, perceived social support was expected to lower norepinephrine levels in individuals. It would accomplish this through a direct effect on norepinephrine as well as through a buffering effect. The results do not support a direct effect, in fact, there is a tendency for a positive relationship, although the standard regression coefficients were not significant. There is some evidence that there is a stress-intensifying effect for females and a stress-buffering effect for males. That is, social support appears to be least effective as a social resource, when a female is experiencing higher levels of anxiety or has not been relatively successful at coping. This may occur because only certain types of social support may be positively related to stress responses. Emotional support is almost always positive while other types of support (i.e., informational support) may sometimes increase stress by making people more dependent on others or increasing people's perceptions of stress. One example used by House (1981) to illustrate this point is that of workers validating and even accentuating each other's feelings of work stress and dissatisfaction. He also points out that honest feedback or appraisals are sometimes painful, but beneficial in the long run (House, 1981:25).

In sum, the immediate social context (i.e., dormitory environment), does have an effect on individual stress responses. There is further evidence that antecedent individual factors such as Type-A behavior and year in school do play a role in the stress process. Social support does have an effect on stress responses, both psychological as well as physiological. These findings vary by sex, and in general the model in Figure 2, appears to be better suited for explaining the stress process among females than among males.

PROBLEM WITH METHOD AND IMPLICATIONS FOR FURTHER RESEARCH

Although much knowledge was gained from this study, there are several issues to consider, both methodological and conceptual. Since there were significant dorm differences, it would be more appropriate to estimate the model for each dorm separately controlling for sex. This would have required a much larger sample than was available.

A second methodological issue is one of causality. In order to test a causal argument, it is necessary to have a longitudinal data set. Baseline measures of norepinephrine are needed for each individual not only after a stressor but before as well. Further information is necessary regarding an individual's diet as well as the amount of exercise they receive since both of these factors have an effect on levels of norepinephrine. Also, other stress hormones, such as epinephrine and the corticosteroids should be measured. It would also be interesting to document the possible involvement of the newly discovered endorphins in this context.

Since social support is multidimensional, it is necessary to consider the source, type and structure of an individual's social support network.

This would make it necessary to get measures of social support from sources other than just the dormitory. This would include getting measures of support from an individual's family, university staff and faculty, as well as from other friends outside the dormitory in which the individual resides. Also since social support is a dynamic variable, it is necessary to get measures of this phenomena before the onset of a stressful event. Thoits (1982), makes a further suggestion. She argues that in order to control for the confounding effects of stress on social support, it is necessary to use only those individuals whose social support remains at the same level as before the stressor occurred.

The possibility of aggression rather than anxiety increasing levels of norepinephrine indicates that it would have been more appropriate to have several measures of different types of affect. Perhaps even a more detailed measure of method or style of coping rather than just a measure of "success at coping" using level of anxiety would have been more useful.

There was also the problem of a sampling bias. The sample chosen may have provided too stringent a test for our model. Those individuals who were likely to volunteer and be accepted as blood donors may be less likely to express anxiety. It would also be interesting to see how the stress process works in other situations such as in the work environment.

Several researchers have argued that the means by which social events are ultimately beneficial or detrimental to health is through the social environment which is expected to modulate the physiological stress responses in individuals. Given that this is the case, an extension of this study would include the collection of health measures both before and after a stressful event or situation has occurred. Another outcome which may be of interest is grades or level of performance.

CONCLUSION

From this study it is clear that the individual characteristics a person brings to a situation have an effect on their appraisal of that situation--e.g., how stressful they perceive the situation to be. This appraisal in turn has an effect on subsequent psychological response and to a lesser extent on physiological response. These links are mediated by the variables in an individual's immediate social environment, in particular, social support.

The variables used to test these concepts were found to be involved in the stress process to some extent. But as the links between these variables were tested, mixed results occurred, indicating that more specific information over time is required to fully test the stress process.

Finally, the process appears to operate differently for males and females. Controlling for individual factors, the relationship between perceived stress and anxiety was much stronger for females. They appear to be more likely to translate their perceptions of stress into feelings of anxiety. Social support as a resource also seems to have a greater impact in lowering their stress responses. This is not immediately clear if these relationships are examined without controlling for individual characteristics. If these factors are not controlled for, the mean level of perceived stress, anxiety, and norepinephrine are virtually identical for both sexes (Table 4).

BIBLIOGRAPHY

Barchas, J. D. , Akil, H., Elliott, G. R., Holman, R. B., and Watson, S. J. "Behavioral Neurochemistry: Neuroregulators and Behavioral States." Science, May 1978, vol. 200, 964-973.

Barchas, P. R. "Physiological Sociology: Interface of Sociological and Biological Processes." Annual Review of Sociology, vol. 2, 1976.

Barr-Bryan, D., Montoya, V., and Barchas, P. "Social Environment and Its Relation to Stress Response Among Individuals; A Descriptive Study." Technical Report No. 84-6. Stanford, CA: The Laboratory for Social Research, Stanford University, 1984.

Baum, A., Singer, J. E., and Baum, C. "Stress and the Environment." Journal of Social Issues, 1981, vol. 37, no. 1, 4-35.

Billings, A., and Moos, R. "Social Support and Functioning Among Community and Clinical Groups: A Panel Model." Journal of Behavioral Medicine, 1982, vol. 5, no. 3.

Billings, A., and Moos R. "Work Stress and the Stress-Buffering Roles of Work and Family Resources." Journal of Occupational Behavior, 1982, vol. 3, 215-232.

Blascovich, J., Major, B., and Katkin, E. "Sex-Role Orientation and Type A Behavior." Personality and Social Psychology, Dec. 1981, vol. 7, no. 4, 600-604.

Bovard, E. "The Effects of Social Stimuli on The Response to Stress." The Psychological Review, Sept. 1959, vol. 66, no. 5, 267-277.

Broadhead, W. E., Kaplan, B., et al. "The Epidemiologic Evidence for a Relationship Between Social Support and Health." American Jounral of Epidemiology, May 1983, vol. 117, no. 5.

Cassel, J. "The Contribution of the Social Environment to Host Resistance." American Journal of Epidemiology, August 1976, vol. 104, no. 2, 107-123.

Cronkite, R., and Moos, R. "Determinants of the Posttreatment Functioning of Alcoholic Patients: A Conceptual Framework." Journal of Consulting and Clinical Psychology, 1980, vol. 48, no. 3, 305-316.

Cronkite, R., and Moos, R. "The Role of Predisposing and Moderating Factors in the Stress-Illness Relationship." In press, Journal of Health and Social Behavior, 1984.

Elliott, G. and Eisdorfer, C. Stress and Human Health: Analysis and Implications of Research. New York: Springer Publishing Co., 1982.

Finney, J., Mitchell, R., Cronkite, R., and Moos, R. "Methodological Issues in Estimating Main and Interactive Effects: Examples from the Coping/Social Support and Stress Field." Journal of Health and Social Behavior, 1984, 25, 85-98.

Frankenhaeuser, M. "Psychoneuroendocrine Approaches to the Study of Emotion as Related to Stress and Coping." In Howe, H. and Dienstbier, R. (eds.), Nebraska Symposium on Motivation 1978. Lincoln: University of Nebraska Press, 1979, 123-161.

Friedman, M., and Rosenman, R. Type A Behavior and Your Heart. New York: Knopf, 1974.

Gerst, M., and Moos, R. "Social Ecology of University Student Residences." Journal of Educational Psychology, 1972, vol. 63, no. 6, 513-525.

Gerst, M., and Sweetwood, H. "Correlates of Dormitory Social Climate." Environment and Behavior, Dec. 1973, vol. 5, No. 4, 440-464.

Glass, D. "Stress, Behavior Patterns, and Coronary Disease." American Scientist, 1977, vol. 65, 177-187.

Gore, S. "The Effect of Social Support in Moderating the Health Consequences of Unemployment." Journal of Health and Social Behavior. June 1978, vol. 19, 157-165.

Henry, J. P., and Stephens, P. M. Stress, Health and Social Environment. New York: Springer-Verlag, 1977.

Holahan, C., and Moos, R. "Social Support and Psychological Distress: A Longitudinal Analysis." Journal of Abnormal Psychology, 1981, vol. 90, no. 4, 365-370.

Holahan, C., and Moos, R. "The Quality of Social Support: Measures of Family and Work Relationships." British Journal of Clinical Psychology, 1983, 22, 157-162.

House, J. Work Stress and Social Support. Menlo Park, CA: Addision-Wesley Publishing Co., 1981.

Kiritz, S., and Moos, R. "Physiological Effects of Social Environments." Psychosomatic Medicine, March-April 1974, vol. 36, no. 2.

Kopin. I. "Catecholamines, Adrenal Hormones, and Stress." In Krieger, T., and Hughes, J. (eds.), Neuroendocrinology. Sunderland, MA: Sinaver Associates, Inc., 1980.

LaRocco, J., House, J., and French, R. "Social Support, Occupational Stress, and Health." Journal of Health and Social Behavior, Sept. 1980, vol. 21, 202-218.

Lazarus, R., et al. "The Psychology of Coping Issues of Research and Assessment." In Coelho, G., and Hamburg, D. (eds.), Coping and Adaptation. New York: Basic Books, Inc., 1974, 249-315.

Margolis, L., McLeroy, K., Runjan, C., and Kaplan, B. "Type A Behavior: An Ecological Approach." Journal of Behavioral Medicine, 1983, vol. 6, no. 3.

Mason, J. "A Review of Psychoendocrine Research on the Sympathetic-Adrenal Medullary System." Psychosomatic Medicine, 1968, vol. XXX, no. 5 (Part II), 631-653.

Mefford, I. N. "Determination of Plasma Catecholamines and Free 3,4-Dihydroxyphenylacetic Acid in Continuously Collected Human Plasma By High Perforamnce Liquid Chromatography with Electrochemical Detection." Life Sciences, 1981, vol. 28, 477-483.

Meyers, J., Lindenthal, J., and Pepper, M. "Life Events and Mental States: A Longitudinal Study." Journal of Health and Social Behavior, Dec. 1972, 13.

Mitchell, R., Billings, A., and Moos, R. "Social Support and Well-Being: Implications for Prevention Programs." Journal of Primary Prevention, Winter 1982, 3 (2).

Mitchell, R., Cronkite, R., and Moos, R. "Stress, Coping, and Depression Among Married Couples." Journal of Abnormal Psychology, 1983, vol. 92, 433-448.

Mitchell, R., and Moos, R. "Deficiencies in Social Support Among Depressed Patients: Antecedents or Consequences of Stress." Journal of Health and Social Behavior, 1984.

Moos, R. "Conceptualizations of Human Environments." American Psychologist, August 1973, vol. 28, no. 8.

Moos, R., and Gerst, M. University Residence Environment Scale Manual. Palo Alto, CA: Consulting Psychologists Press, Inc., 1974.

Moos, R., Van Dort, B., Smail, P., and DeYoung, A. "A Typology of University Student Living Groups." Journal of Educational Psychology, 1975, vol. 67, no. 3, 359-367.

Moos, R., and Van Dort, B. "Student Physical Symptoms and the Social Climate of College Living Groups." American Journal of Community Psychology, 1979, vol. 7, no. 1, 31-43.

Rosenfield, S. "Sex Differences in Depression: Do Women Always Have Higher Rates." Journal of Health and Social Behavior, March 1980, vol. 21, 33-42.

Sachar, E. "Hormonal Changes in Stress and Mental Illness." In Krieger, D., and Hughes, J. (eds.), Neuroendocrinology. Sunderland, MA: Sinauer Associates, Inc., 1980.

Selye, H. (ed.). Selye's Guide to Stress Research. vol. 1, New York: Van Nostrand Reinhold Co., 1980.

Smail, M., DeYoung, A., and Moos, R. "The University Residence Environment Scale: A Method for Describing University Student Living Groups." Journal of College Student Personnel, Sept. 1974.

Thoits, P. "Conceptual, Methodological and Theoretical Problems in Studying Social Support as a Buffer Against Life Stress." Journal of Health and Social Behavior, June 1982, vol. 23, 145-159.

Zuckerman, M. "The Development of An Affect Adjective Check List for the Measurement of Anxiety." Journal of Consulting Psychology, 1960, vol. 24, no. 5, 457-462.

Table 1. Basic Statistics and Correlations For Males and Females

VARIABLES	MALES			FEMALES		
	Mean	Standard Deviation	No. of Cases	Mean	Standard Deviation	No. of Cases
Type-A	3.40	1.10	98	3.70	1.00	86
Year In School	1.70	1.10	98	1.60	1.00	86
University Anxiety	7.30	3.00	98	7.30	29.00	86
Perceived Social Support	79.20	14.70	89	83.00	14.20	81
Perceived Stress	119.34	19.85	86	119.91	20.60	81
Social Support X Stress	69.13	262.07	86	59.16	352.93	79
Social Support X University Anxiety	3.90	47.30	89	8.50	29.20	81
Time of Day	16.50	2.20	93	16.30	2.20	83
Norepinephrine	0.08	0.16	76	.30	0.13	75

Table 2. Pearson's Correlation Coefficients For Males

Variables	Type-A	Year In School	University Anxiety	Perceived Social Support	Perceived Stress	Social Support X Stress	Social Support X University Anxiety	Time of Day	Norepi-nephrine
Type-A		.10	-.04	.05	.18**	-.05	.02	-.16*	-.08
Year in School			.08	.006	-.03	.02	-.04	-.30**	.05
University Anxiety				-.09	.08	.06	.17**	-.02	-.006
Perceived Social Support					-.17**	.11	.11	.08	.11
Perceived Stress						-.18**	.06	-.05	-.02
Social Support X Stress								.07	-.003
Social Support X University Anxiety								-.02	-.003
Time of Day									-.16*
Norepinephrine									---

*p≤.10, **p≤.05, ***p≤.01

Table 3. Pearson's Correlation Coefficients for Females

Variables	Type-A	Year In School	University Anxiety	Perceived Social Support	Perceived Stress	Social Support X Stress	Social Support X University Anxiety	Time of Day	Norepi-nephrine
Type-A		.35***	-.06	.12*	.16*	.30***	-.06	-.11	-.15*
Year in School			-.08	-.07	.24**	.08	-.01	-.22**	-.01
University Anxiety				-.21**	.25**	-.14*	-.08	-.08	-.16*
Perceived Social Support					-.16*	.35***	-.47***	.11	-.008
Perceived Stress						.07	-.22**	-.27**	-.17*
Social Support X Stress								-.09	.14*
Social Support X University Anxiety								.06	.26**
Time of Day									.10
Norepinephrine									---

*p≤.10, **p≤.05, ***p≤.01

Table 4. Results from the Kruskol-Wallis One-Way Analysis of Variance by Ranks Testing for Dormitory Differences

	DORM A	DORM B	DORM C	DORM D
PERCEIVED SOCIAL SUPPORT:				
Mean ranks	108.25	72.11	68.78	93.18
No. of cases	40	35	48	47
Chi-Square = 17.9				
Level of significance = .001				
PERCEIVED STRESS:				
Mean ranks	61.32	98.31	88.59	88.86
No. of cases	40	32	48	47
Chi-Square = 12.512				
Level of Significance - .006				
UNIVERSITY ANXIETY:				
Mean ranks	89.22	95.16	102.51	83.55
No. of cases	48	40	48	48
Chi-Square = 3.37				
Level of Significance = .34				
NOREPINEPHRINE:				
Mean ranks	77.51	64.44	77.62	100.27
No. of cases	44	31	41	46
Chi-Square = 12.07				
Level of Significance = .007				

Note: This analysis was performed on the sample as a whole. No distinction was made based on sex.

Table 5. The Relationship of Antecedent Individual Factors and Social Support on Perceived Stress: Standardized Regression Coefficients (standard error)

INDEPENDENT VARIABLE	MALES	FEMALES
Antecedent Individual Factors:		
Type-A Behavior	.22* (.12)	-.05 (.17)
Year in School	.09 (.12)	.35** (.17)
External Factors:		
Perceived Social Support	-.18 (.12)	-.18 (.15)
Intercept	119.26	132.499
R^2	0.10	0.15
Adjusted R^2	0.05	0.09

*$p \leq .10$, **$p \leq .05$

Table 6. The Relationship of Antecedent Individual Factors, Perceived Stress, and Social Support on University Anxiety: Standardized Regression Coefficients (standard error)

INDEPENDENT VARIABLE	MALES	FEMALES
Antecedent Individual Factors:		
Type-A Behavior	-.14 (.13)	.07 (.17)
Year in School	.11 (.13)	-.20 (.18)
Internal/External Factors:		
Perceived Social Support	-.05 (.13)	-.15 (.17)
Perceived Stress	.08 (.13)	.34** (.15)
Stress X Social Support	.09 (.14)	-.11 (.16)
Intercept	6.71	4.415
R^2	0.04	0.18
Adjusted R^2	-0.04	0.08

*$p \leq .10$, **$p \leq .05$

Table 7. The Effect of Antecedent Individual Factors, and Internal/ External Mediating Factors on Norepinephrine for Males and Females: Standardized Regression Coefficients (standard error)

INDEPENDENT VARIABLE	MALES	FEMALES
Type-A	-.23* (.13)	-.29* (.17)
Year in School	-.11 (.14)	.24 (.18)
Stress	.15 (.14)	-.05 (.18)
University Anxiety	-.13 (.13)	-.08 (.16)
Social Support	.16 (.13)	.12 (.22)
Time of Day Samples Was Taken	-.24* (.14)	.10 (.16)
Social Support X Stress	.09 (.14)	.24 (.16)
Social Support X University Anxiety	-.05 (.13)	.29 (.21)
Intercept	.44	.27
R^2	.12	.24
Adjusted R^2	-.01	.08

*$p \leq .10$, **$p \leq .05$

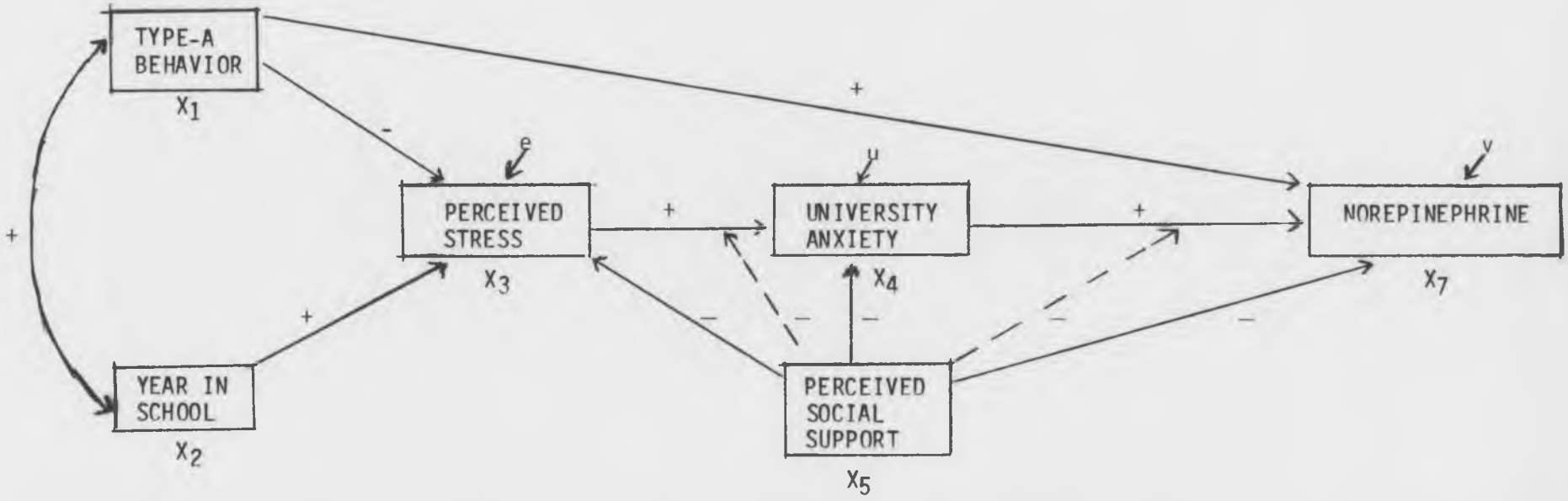

Figure 2.
A MODEL OF PHYSIOLOGICAL STRESS RESPONSES

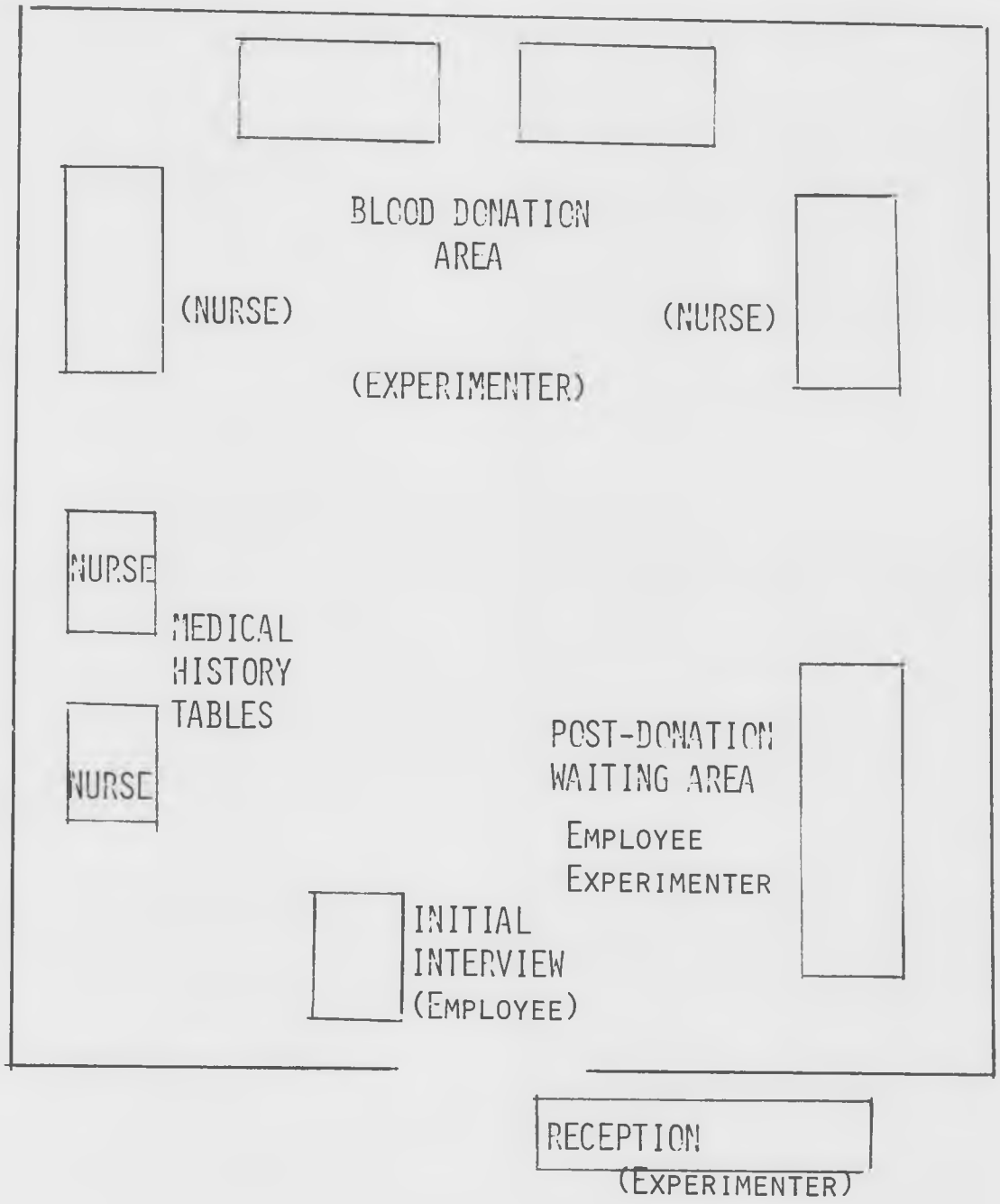

Figure 1.

Lay Out of Blood Donation Area