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Retention of Learned Stress-Reduction Techniques
in Mildly Hypertensive Patients

by

Carol Chapman Ruff

THESIS

Submitted in partial satisfaction of the requirements for the degree of

MASTER OF SCIENCE

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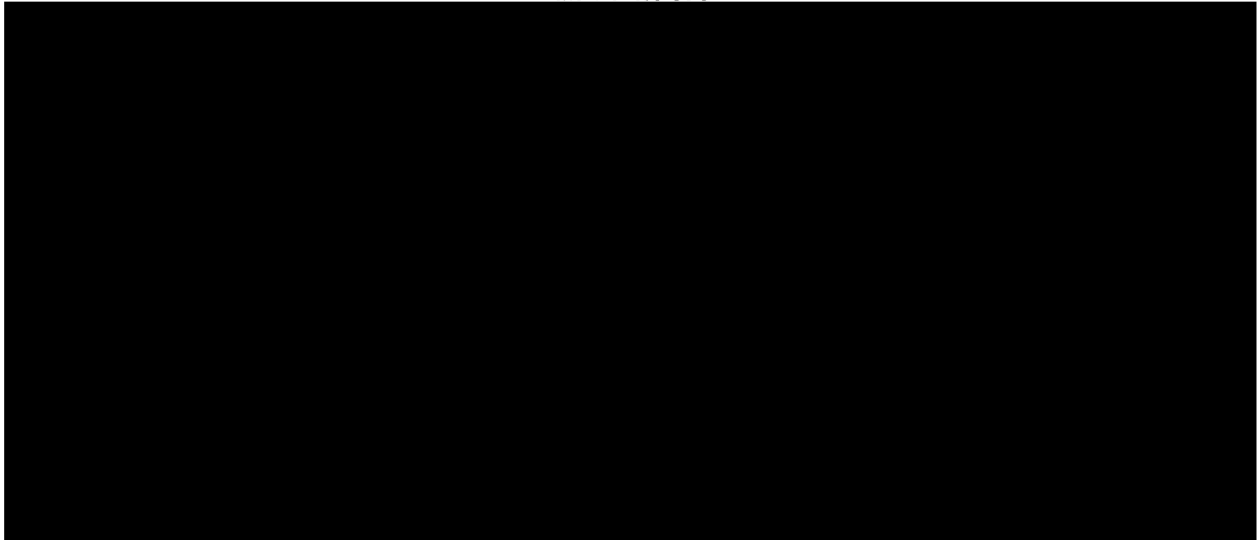
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Chapter 1

INTRODUCTION

Studies of the incidence of hypertension in the world population indicate that it is probably the world's most prevalent chronic disease. Incidence of those who have it, or will have it, varies from 10% to 15% in most populations (Mendlowitz, 1974). Hypertension is seen most often in males over 35 years of age and females over 45. It cuts through all socioeconomic and educational levels (Shank, 1974).

Hypertension is the most significant known risk factor in the development of strokes, congestive heart failure, renal insufficiency, atherosclerotic pneumonia, and arterial lesions in general. It is also a pre-disposing factor in coronary heart disease and myocardial infarctions. It is the biggest single causative factor in all deaths (Laragh, 1974).

The factors associated with hypertension are thought to be increased age, obesity, genetic or racial predisposition, increased sodium intake, and psycho-social stress (Page, 1973). Physiologic responses to stress which are normally protective and adaptive may persist to a pathologic degree, resulting in increased blood pressure (Laragh, 1974).

Stress has been shown to increase blood pressure. Experimental studies have shown that increased blood pressure can be produced in rats and monkeys when they are exposed to stress. Excessive and continued noise, sexual frustration, and random punishment were used as stress factors (Friedman, 1976; Mendlowitz, 1974). Human studies have shown

that people who work in stressful occupations tend to have higher blood pressures than do those whose occupations are not so stressful (Cobb and Rose, 1973; Jonsson and Hansson, 1977; Kunin and McCormack, 1968).

Several studies on the effectiveness of methods of stress reduction have been conducted. Transcendental Meditation, bio-feedback, yoga, and Jacobson's progressive relaxation have been shown to cause a decrease in blood pressure (Benson, 1974; Blackwell, 1976; Jacobson, 1938; Kristt, 1975; Patel, 1975; Redmond, 1974). Studies have shown that several versions of the above relaxation techniques can be taught to patients well enough that they can continue the techniques alone at home (Redmond, 1974).

People with mild hypertension, described as a diastolic pressure in the range of 90 to 105 mm Hg, are considered to be as much at risk from all the complications associated with hypertension as are those with more severe hypertension. Drug treatment is frequently not recommended for patients in this group, partly because of the associated risks of drug treatment (DHEW, 1973). Since drug therapy is frequently not recommended for this group of patients, it would be particularly advantageous to treat them by stress-reduction. However, one of the difficulties encountered in treating patients with stress-reduction has been the reluctance of the patients to continue the techniques after they have been taught. This is probably due to the fact that mild hypertension is usually asymptomatic, and, therefore, the motivation to continue is frequently lacking.

According to Hilgard (1966), frequency of repetition is important in acquiring skills and in bringing enough over-learning to guarantee retention. Jacobson (1938) states that repetition is the keynote of the entire method of relaxation. Rehearsal serves as an important memory aid.

When people mentally rehearse or actually perform modeled behaviors, they are less likely to forget them than if they neither think about them nor practice what they have seen (Bandura, 1969). Skinner's theories of operant conditioning suggest that behavior can be modified if appropriate and frequent reinforcements are offered for the desired behavior (Skinner, 1968). This suggests that patients could be taught the relaxation techniques, and then, with regularly scheduled refresher classes, the techniques could become incorporated by the patients. Over a period of time, the decreased blood pressure could serve as a positive reinforcement for the patient to continue the regular practice of relaxation.

Specific Aims and Hypotheses

The purpose of this study is to determine whether refresher classes will result in continued use of a stress-reduction technique by mildly hypertensive patients who have been taught such a technique. The assumption is that with continued encouragement and practice, patients will be more likely to continue treatment which has been shown to be beneficial to them. It is also assumed that patients who do not have continued encouragement and practice will either discontinue treatment or will practice it sporadically with few positive results.

Hypotheses

1. One month following the Relaxation Response course, there will be no difference in diastolic pressure between the group followed up with a refresher class and the group not followed up with a refresher class.

2. Two months following the Relaxation Response course, patients who have been taught Relaxation Response and followed up with a refresher

class will have a lower diastolic pressure than patients who have been taught Relaxation Response but not followed up with a refresher class.

3. Three months following the Relaxation Response course, patients who have been taught Relaxation Response and followed up with a refresher class will have a lower diastolic pressure than patients who have been taught Relaxation Response but not followed up with a refresher class.

4. Four months following the Relaxation Response course, patients who have been taught Relaxation Response and followed up with a refresher class will have a lower diastolic pressure than a group of patients taught Relaxation Response but not followed up with a refresher class.

Chapter 2

REVIEW OF LITERATURE

Effect of Stress on Blood Pressure

Prolonged emotional stress, such as interpersonal conflicts, overwork, fatigue, or frustration have a significant influence on emotional balance and personal fulfillment. Laragh (1974) states that physiologic changes can occur in people as the result of real or imagined stress. Physiologic responses to stress which are normally protective and adaptive may persist to a pathologic degree to the learned behavior patterns. Gomez (1977) has suggested that circulatory mechanisms fail temporarily, and later, permanently when their capacity for regulation is exceeded, as can be the case with prolonged stress. Laragh (1974) also suggests that stress increases sympathetic nerve hyperactivity which then stimulates renin release, resulting in increased angiotensin II. Angiotensin stimulation and the inherent auto-regulatory factors of various vascular beds may then result in a more pronounced diastolic hypertension.

Animal studies have demonstrated a relationship between stress and increased blood pressure. Friedman (1976) studied two different strains of rats — one strain which had in previous studies been shown to be resistant to developing high blood pressure (R), and one which had been shown to be susceptible to developing high blood pressure (S). S and R rats were randomly assigned to two groups — experimental and control. In the experimental group, the rats received random shocks, food pellets

or both, upon pressing a food lever. Rats were weighed and blood pressure was measured weekly for a period of 26 weeks. There was no difference in the weight of the S and R rats of the experimental group, indicating there had been no difference in lever pressing. However, only the S rats in the experimental group showed a definite increase in blood pressure. This would indicate that stress coupled with a genetic pre-disposition can increase blood pressure. This experiment appears to have been very well controlled with randomization of the four groups of rats.

In another study, Henry, Meehan, and Stephens (1967) experimented with one strain of rat in several experimental conditions. Litters of rats were divided into control and experimental groups. The experimental groups consisted of mixed groups of rats. These groups included one group of rats which had been socially isolated, one in which rats were overcrowded, and one in which rats constantly lived in close proximity to a predator — a hungry cat. In all of the groups with induced stress, there was a 21% increase in blood pressure in male rats, and a 10% - 16% increase in blood pressure in female rats. When normal conditions were returned, the blood pressure gradually decreased. In this experiment there was a high mortality rate of litters of rats born under experimental conditions. This caused the researchers to add more rats to the experiment as it progressed, creating a more heterogeneous population than that at the beginning.

Human studies tend to be more empiric. Cobb and Rose (1973) studied 4,325 air traffic controllers and 8,435 second class airmen. Air traffic controllers were selected because of the stressful nature of their jobs. Second class airmen were selected as a comparison because of similarities in age, background, and the fact that they, like the controllers,

were required to give evidence of a physical examination for renewal of their licenses. All the subjects were examined and had their blood pressure measured and compared to their earlier medical records. The air traffic controllers had a rate of hypertension 4 times greater than that of the airmen. The mean onset of hypertension in the air traffic controllers was 41 years, compared to 48 years for the second class airmen. There is some question that other intervening variables may have been involved, such as differences in diet, lifestyle, or personality factors in the two groups. However, the large size of the samples gives increased credibility to the study.

Jonsson and Hansson (1977) compared a group of 44 male industrial workers with a noise induced hearing loss to a group who had not suffered a hearing loss. They hypothesized that repeated and prolonged exposure to a stressful stimulus (industrial noise severe and prolonged enough to cause a permanent loss of hearing) may be a contributing factor to a rise in blood pressure. The results of the study showed significantly higher diastolic and systolic levels in the group with the hearing loss. There were no other obvious differences in the groups other than the noise induced hearing loss. As there have been no indications that a hearing loss in itself will result in an increase in blood pressure, it is reasonable to conclude that the stress of excessive and prolonged noise was the cause of the increase.

Kunin and McCormack (1968) compared a group of 3304 nuns to 2698 working women in an epidemiologic study of bacteriuria and blood pressure. Urine samples were analyzed and blood pressures were measured once for each subject. Throughout the age range black nuns and white nuns had a lower blood pressure than did black working women and white working

women. The validity of this study is more open to question than that of the previous ones. The nuns were drawn from many different convents ranging from New York to New Orleans. The working women were chosen from one county in Virginia. The lifestyles of the nuns and working women were quite different. The study was originally done to study the relationship between bacteriuria and blood pressure, and the findings of the nuns' decreased blood pressure was one of the unexpected findings. It would probably be better to view these findings as an indication of a trend rather than as additional proof for the stress-hypertension theory.

Effect of Relaxation on Blood Pressure

A review of the literature suggested that relaxation or relaxation-type procedures resulted in greater reduction in blood pressure than did placebo or other control procedures. Relaxation or relaxation-like procedures shared the features of muscular relaxation, regular practice, mental focusing, and task awareness (Jacob, Kraemer, and Agras, 1977). Taylor, Farquhar, Nelson, and Agras (1977) studied thirty-one patients who were receiving medical treatment for essential hypertension. The subjects were randomly distributed into three groups, (1) relaxation therapy, (2) non-specific therapy, and (3) medical treatment only. The non-specific therapy group spent the same amount of time with the therapist as the relaxation group, but was not given a specific therapy. This was to control for "Hawthorne effect." The relaxation therapy group showed a significant reduction in blood pressure post-treatment compared with the non-specific therapy and medical treatment only groups, even when those patients whose medication was increased were excluded

from the data analysis. The randomization of the subjects and the control for "Hawthorne effect" would seem to insure the validity of this study.

Stone and DeLeo (1976) conducted a six-month trial to measure physiologically the effect of psychologic relaxation on blood pressure. Alterations of peripheral sympathetic nervous system activity, as reflected by changes of dopamine-beta-hydroxylase in plasma, were evaluated. The study consisted of two groups — fourteen in the experimental group and five in the control group. Measurements were made monthly for a period of six months. Urinary sodium excretion was measured to monitor sodium intake. The results showed an average 12 mm Hg reduction in arterial pressure in the experimental group and correlated well with a decrease in dopamine-beta-hydroxylase.

The fact that the subjects were not randomized in this study but were arbitrarily assigned to groups raises some question regarding its validity. However, the importance of the physiological data and the care given to gathering and analyzing the data give credibility to the results.

Patel (1973) used yogic relaxation and bio-feedback techniques in the treatment of twenty hypertensive patients. The patients who were selected were the first twenty with a history of hypertension who came to a physician's office. They attended the relaxation sessions three times weekly for three months. The results showed that antihypertensive therapy was stopped altogether for 25% of the patients, and it was reduced by 33% to 60% in 35% of the patients. Blood pressure control was improved in 20% of the patients, and 20% showed no improvement. In this study the patient's own history served as a control, and there was no

control for maturation or "Hawthorne effect." However, there was evidence of improvement of the hypertensive condition of the patients.

Kristt and Engel (1975) studied a group of five patients with documented history of essential hypertension of at least 10 years' duration. The study had three phases. Phase I was a seven-week period when patients took their own blood pressures at home and mailed in the results. Phase II was a three-week period during which patients were trained to raise, lower, and alternately to raise and lower systolic blood pressure. Phase III was a three-month period during which patients again took their own blood pressures at home and mailed in the results daily. The purpose of teaching the patients to both raise and lower their blood pressure was to demonstrate to them the amount of control they had over their blood pressure. The results indicated that all patients learned systolic blood pressure control. The average increase in systolic pressure was 15% and the average decrease was 11%. Followup at one and three months showed evidence of retained control. Baseline systolic pressure dropped from 153 mm Hg during laboratory training to 135 mm Hg at the three-month followup. This study has several problems in regard to validity. There was no randomization, no control for maturation or "Hawthorne effect," and the sample of five is quite small. The use of a control group would have strengthened this study. However, the resulting decrease in pressure in all five patients is somewhat dramatic.

Although there have been several reports on the effectiveness of relaxation training in decreasing blood pressure, the effectiveness of the treatment is diminished if people discontinue the regular practice of the exercises. Blackwell, Bloomfield, Gartside, Robinson, Haneson, Magenheim, Nidich, and Zigler (1976) studied a group of seven volunteer

subjects with hypertension. They were stabilized on drugs for a ten-week period, then began a course on transcendental meditation (T.M.) which lasted four days. After twelve weeks of practicing T.M. there was a substantial decrease in anxiety in six subjects, and a decrease in blood pressure in four subjects. After a six-month period with no supervision, only three subjects continued to show decreased blood pressure, and two of these could be attributed to new medication. In this study subjects served as their own control, and there was no control for maturation. However, the followup data was important and indicated reluctance to continue the relaxation technique once the class was over.

Chapter 3

CONCEPTUAL FRAMEWORK

Learning theory forms the conceptual framework of this study. Four specific aspects of social learning theory to be discussed are observational learning, rehearsal, reinforcement, and self-reinforcement.

Observational Learning

Social learning theory includes a form of learning known as observational learning or modeling. This means that the learner observes someone else perform the behavior that the learner is to perform. Bandura (1969) discussed a study in which college students made over a thousand errors and never did fully acquire a complicated sequence of behavior when their only guidance was in the form of feedback of correctly performed elements. However, when other subjects observed a model performing the behaviors, they learned the behavior rapidly, and were spared the frustration shown by the trial and error group.

Bandura (1969) further states that it would be difficult to imagine a culture in which the language, mores, family, and social customs were learned by each member in a trial and error method rather than through the guidance of models who have previously acquired the acceptable behaviors. Mager (1968) comments that "if we had to learn everything through trial and error, or by making responses and then having them corrected, a lot fewer of us would survive" (p. 62).

Observational learning requires that people perceive accurately the significant features of behavior that is being demonstrated or modeled. Rehearsal serves as an important memory aid. When people mentally rehearse or actually perform a behavior, they are much less likely to forget it than if they neither think about it nor practice what they have seen. The highest level of observational learning is achieved by first organizing and rehearsing the modeled behavior symbolically and then enacting it overtly (Bandura, 1977). Hilgard and Bower (1966) also write that instructions given the subject before he observes the model provide him with high or low motivation to pay attention to and learn the model's behavior. This indicates that the learner needs an opportunity to observe the desired behavior performed by a model and instructions for performing that behavior.

Rehearsal

Rehearsal is important in learning a skill. Ideas are rarely transformed on the first attempt into correct actions without error. In most everyday learning, people usually achieve a close approximation of the new behavior by modeling, and they refine it through self-corrective adjustments on the basis of feedback from an instructor or model (Bandura, 1977). Hilgard and Bower (1966) observe that for some finely skilled performances more benefit derives from actual practice in the skill (once started on it) than from further observing the model. In regard to relaxation, Jacobson (1938) states that repetition of practice is the keynote of the entire method of relaxation.

In a discussion of stimulus-response theory, Hilgard and Bower (1966) discuss the following principles:

1. The learner should be an active rather than a passive listener or viewer.
2. Frequency of repetition is important in bringing enough over-learning to guarantee retention. (One does not learn to type, play the piano, or speak a foreign language without some repetitive practice.)
3. Generalization and discrimination suggest the importance of practice in various contexts so that learning will become appropriate to a wider range of stimuli.

Reinforcement

Skinner's analysis of modeling specifies reinforcement as a necessary condition for observational learning (Skinner, 1953). Repetition should be under arrangements in which desirable or correct responses are rewarded (Hilgard and Bower, 1966). It is generally true that positive reinforcements are more effective than negative reinforcements in acquiring skills. A list of reinforcers commonly contains biological items like food, water, and sexual contact. Learned or secondary reinforcers include money, praise, social approval, attention, dominance, and the spoken exclamation "good" (Hilgard and Bower, 1966). Recording forms can also act as a form of reinforcement. The learner can derive encouragement and reinforcement from a visible record of behavior and behavior change (Berni and Fordyce, 1977).

Self-Reinforcement

It is generally assumed that when a behavior change is accompanied by a set of congruent attitudes the behavior has become effectively internalized. However, according to Bandura (1969), even so-called internalized behavior remains under reinforcement feedback control, although it may be relatively independent of externally occurring consequences. Response patterns can be effectively maintained without social or natural support by their intrinsic natural consequences, i.e., piano playing becomes more satisfying as the learner becomes more accomplished. Response patterns can be partly maintained by anticipatory consequences. Real or imagined aversive consequences can have such overpowering effects on the learner's behavior that it can become relatively autonomous of external reinforcements. Response patterns can be controlled by self-evaluation consequences. People adopt certain standards of behavior and generate self-rewarding or self-punishing consequences depending on how their behavior compares to their self-prescribed demands. Stacey and DeMartino (1965) observe that habits apparently provide their own motivation even when the original motives which caused them to be formed no longer exist.

Therefore, it would seem that a relaxation class based on the principles of observational learning, rehearsal, reinforcement, and self-reinforcement is an appropriate approach to the reduction of stress. The reduction of stress would then cause a decrease in diastolic blood pressure.

Chapter 4

METHODOLOGY

Research Design

This study was a pilot study for a larger study to be conducted at a later time. The design of the study was a multiple time series design. A group of ten subjects was taught the relaxation technique in a basic class and was then divided randomly into experimental and control groups. The experimental group continued to meet monthly for three months for refresher classes. The blood pressures of all the subjects were measured once each month for a period of four months. The diastolic pressures of the groups were compared by an analysis of covariance.

Sample

The sample for the study consisted of ten subjects whose diastolic pressures ranged from 85-100. They were all over 21 years of age and were able to understand spoken English. None of the subjects was currently taking antihypertensive medication, and all had their physician's consent to participate in the study. Subjects were required to attend at least two of four classes of the basic relaxation class in order to participate in the study. All but two attended all the classes.

The study took place in Kaiser-Permanente Medical Center, Santa Clara, California. Approval was granted by the administrators of the

institution to interview patients as they completed the multiphasic screening portion of their health examinations. The screening process included glaucoma, vision and hearing testing, X-ray, laboratory tests, and blood pressure measurement. The clinic nursing assistant who checked the patients' charts at the end of this process also checked the blood pressure reading. If the diastolic was in the range of 85-100, she asked the patients to speak to the investigator for a few minutes regarding a possible blood pressure study. All but one agreed to this.

In the interview the investigator introduced herself and attempted to elicit information regarding past history of blood pressure problems. It had been decided to select people who had been told previously that they had some problems with blood pressure. It was felt that those who were unaware of ever previously having elevated blood pressure might be having only a transitory elevation, and may or may not be in need of having any medical attention. It is generally agreed that no decision about blood pressure can be accurately made until three consecutive measurements indicate an elevation of diastolic or systolic pressure. The range of 85-100 was chosen because a diastolic of 85 is considered by many authorities to be high enough to cause some concern. 100 was chosen as the upper end of the range because the clinic had a policy of immediately referring to a medical clinic anyone whose diastolic was over 100. The potential for being started on antihypertensive medication for anyone with a diastolic over 100 and a referral to medical clinic was too high to justify including them in the study.

The interview process gave the investigator the opportunity to judge the potential subject's ability to understand English. If a

person was able to understand the discussion, he would probably be able to understand the procedures and instructions in the class.

It was felt that antihypertensive medication would have an effect on blood pressure independent of the relaxation class and would mask or distort possible results. Therefore, it was decided that anyone on antihypertensive medication would be eliminated from the study. Subjects who were placed on antihypertensive medication after the study began were dropped from the sample. One subject was dropped.

Potential subjects for the study were told that relaxation exercises had been shown to decrease blood pressure in those who practiced them regularly. The classes were briefly described, including the time and location. When potential subjects indicated an interest in the class, the investigator took their names and telephone numbers and called them when a class was starting. At the initial contact, subjects were given a brief description of the class to take home to read. (See Appendix A) A class was started when the investigator had ten interested subjects.

Class Procedure

The procedure consisted of two parts: (a) A series of four one-hour classes offered once a week for four weeks. All subjects attended this series. (b) Three refresher classes offered once a month for three months. Only the experimental subjects attended these classes. Blood pressure measurements were taken on all the subjects before the first class.

The Relaxation Series

The first session consisted of a discussion of stress and the need for a method to reduce stress. The possible positive effects of a relaxation technique was repeated. The specific technique to be learned was developed by Benson (1975) and was referred to by him as the relaxation response. This procedure consists of:

1. Sitting quietly in a comfortable position with eyes closed.
2. Deeply relaxing all muscles, beginning at the feet and progressing up to the face, and keeping them relaxed.
3. Breathing through the nose, and becoming aware of one's own breathing. As they breathe, they are to say a word or a phrase silently to themselves. The word could be "one," or it could be a different word or a prayer or a phrase which has some special meaning to the subject.

This procedure continued for 10-20 minutes. The subjects could open their eyes to check the time, but they were not to use an alarm. When they were finished they opened their eyes and sat quietly for a few seconds. This procedure was to be practiced once each day. The time was chosen by the subject and could be any time of the day. It was strongly recommended, however, that the subject attempt to practice at the same time each day. This was to encourage development of a habit. The subjects were all given a form to chart the procedure each time they practiced it. (See Appendix B) This form also had a portion on which blood pressure could be recorded. This was to give them some visual reinforcement and encouragement to continue the daily practice of the procedure.

The second session consisted of a discussion of how the members were doing with their relaxation practice at home. The investigator once again led the group through a relaxation exercise. Discussions followed regarding how easy or difficult it had been to relax. Near the end of the class the group members were given an opportunity to relax without the verbal instructions of the leader. Once again, discussion followed regarding how easy or difficult it had been.

The third and fourth sessions were almost identical. Discussion and questions and answers continued as in the two previous sessions. However, in these last two sessions, the instructor did not lead the class members through the relaxation exercise. The class members relaxed without guidance for two 15-minute periods during each of the last two sessions. At the end of the fourth session, all the group members were encouraged to continue the practice of the relaxation exercises at home.

When some of the subjects indicated that they were having difficulty with the exercises at home during the early sessions of the class, it was suggested to them that they not try to do the exercises, but rather to just spend 15-20 minutes alone in a quiet place, resting quietly. After two weeks, they were encouraged to attempt the relaxation technique once again.

At the end of the fourth session of the basic series, subjects were randomly assigned to either the experimental or control group. The experimental group members were notified that a refresher group would be held at the same location once a month for the next three months. All subjects in this group agreed to attend.

The Refresher Classes

The refresher classes were very similar to the last two sessions of the basic series. There was discussion regarding how easy or difficult it was to continue practicing the technique, and other discussion. The subjects in the group were asked to bring the charting forms with them to each meeting so they could be reviewed. Any correlation between blood pressure and the amount of practice of the relaxation techniques could be compared.

Data Collection

The blood pressure of the subjects was measured at the end of the series of classes and monthly during a home visit by the investigator. The home visits were usually made in the evening after the subjects had returned home from work. The measurements were made with the subject seated, with right arm resting at the level of the heart, using a standard aneroid sphygmomanometer. The diastolic level used was disappearance of sound (phase 5). Measurements were recorded on both the investigator's record and on the subject's record. (See Appendix B) If the subjects had recorded the times they had practiced the relaxation exercises, they would be on the record sheet and would be discussed. If there was no record of exercises having been practiced, the investigator asked, "How are the relaxation exercises coming along?" The subjects then discussed whether or not they had practiced, how often, and for how long.

Chapter 5

FINDINGS

Characteristics of Sample

Data were collected on demographic characteristics of the sample. Table 1 presents control and experimental groups by sex, employment status, and marital status.

Table 1

Control and Experimental Groups by
Sex, Employment Status, and Marital Status

	Experimental	Control
Male	4	4
Female	1	1
Employed	5	4
Unemployed	0	1
Married	4	5
Divorced	1	0

All were Caucasian except for one control group subject who was Mexican-American. The mean age of the experimental group was 48.2 years (S.D. = 12.2 yrs.) in contrast to a mean age of the control group which was 40.6 years (S.D. = 6.2 yrs.). Table 2 presents experimental and control groups by age and sex.

Table 2

Experimental and Control Groups by Age and Sex

Experimental		Control	
Age	Sex	Age	Sex
60	F	49	M
55	M	43	M
53	M	40	M
44	M	39	M
29	M	32	F

The only significant difference between the groups was the baseline diastolic pressure. Baseline diastolic pressure was the measurement taken at the end of the four-week class. The experimental group had a significantly lower baseline diastolic pressure than the control group. This is rather unusual in view of the fact the mean age of the experimental group was higher than that of the control group, and increased age is one of the factors associated with increased blood pressure.

Although the subjects were randomly assigned to the experimental and control groups, there was a significant difference between the two groups, as discussed above. The probable reason for the difference was the small sample size and the ease with which a small sample can be skewed.

Findings Related to the Proposed Hypotheses

Hypothesis I states that one month following the Relaxation Response course, there would be no difference in diastolic pressure between the group followed up with a refresher class and the group not followed up

with a refresher class. A t-test comparing diastolic pressure at one month with the baseline pressure indicates there was no significant difference between the groups. However, since the groups were significantly different at the baseline measurement (see Table 3), it appears that there was a much greater decrease in diastolic pressure in the control group than in the experimental group. Considering these circumstances, hypothesis I was rejected.

Table 3

Comparison of Mean Diastolic Pressure of Groups at
Different Months to Baseline Diastolic Pressure

	N	Mean	S.D.	p
Baseline				
Exp. Group	5	93.2	5.762	0.023
Control Group	5	102.6	4.775	
Month 1				
Exp. Group	5	88.0	6.633	0.520
Control Group	5	91.2	8.319	
Month 2				
Exp. Group	5	82.4	7.403	0.344
Control Group	5	87.6	8.877	
Month 3				
Exp. Group	5	86.3	6.122	0.220
Control Group	5	91.6	6.387	
Month 4				
Exp. Group	5	84.0	12.570	0.804
Control Group	5	86.0	12.082	

Hypothesis II states that two months following the Relaxation Response course, patients who have been taught Relaxation Response and followed up with a refresher class will have a lower diastolic pressure than patients who have been taught Relaxation Response but not followed up with a refresher class. At the end of two months, there was no significant difference between the two groups. Therefore, hypothesis II was rejected.

Hypothesis III states that three months following the Relaxation Response course, patients who have been taught Relaxation Response and followed up with a refresher class will have a lower diastolic pressure than patients who have been taught Relaxation Response but not followed up with a refresher class. At the end of three months, there was no significant difference between the groups. Therefore, hypothesis III was rejected.

Hypothesis IV states that four months following the Relaxation Response course, patients who have been taught Relaxation Response and followed up with a refresher class will have a lower diastolic pressure than a group of patients taught Relaxation Response but not followed up with a refresher class. At the end of four months, there was no significant difference between the two groups. Therefore, hypothesis IV was rejected.

An analysis of covariance was used to compare the overall decrease in diastolic pressure of both groups and to take into account the differences in baseline diastolic pressures. The analysis of covariance showed no statistical difference between the two groups.

Since there were no statistical differences between the two groups at any time other than baseline, it was decided to combine the two groups

to see if there were significant differences between the monthly measurements of the total group and the baseline measurements. T-tests comparing the group mean of each month's measurement was compared to the baseline measurement. This indicated that the measurements made at the second and third months showed a significant decrease, but measurements made at the first and fourth months did not show a significant decrease (See Table 4).

Table 4

T-Test of Each Month Compared to Baseline.
Experimental and Control Groups Combined.

	N	Mean	S.D.	p
Baseline		97.90	7.031	
Month 1	10	89.60	7.291	0.260
Baseline		97.90	7.031	
Month 2	10	85.00	8.179	0.043
Baseline		97.90	7.031	
Month 3	10	88.97	6.517	0.037
Baseline		97.90	7.031	
Month 4	10	85.00	11.671	0.176

Summary of Results

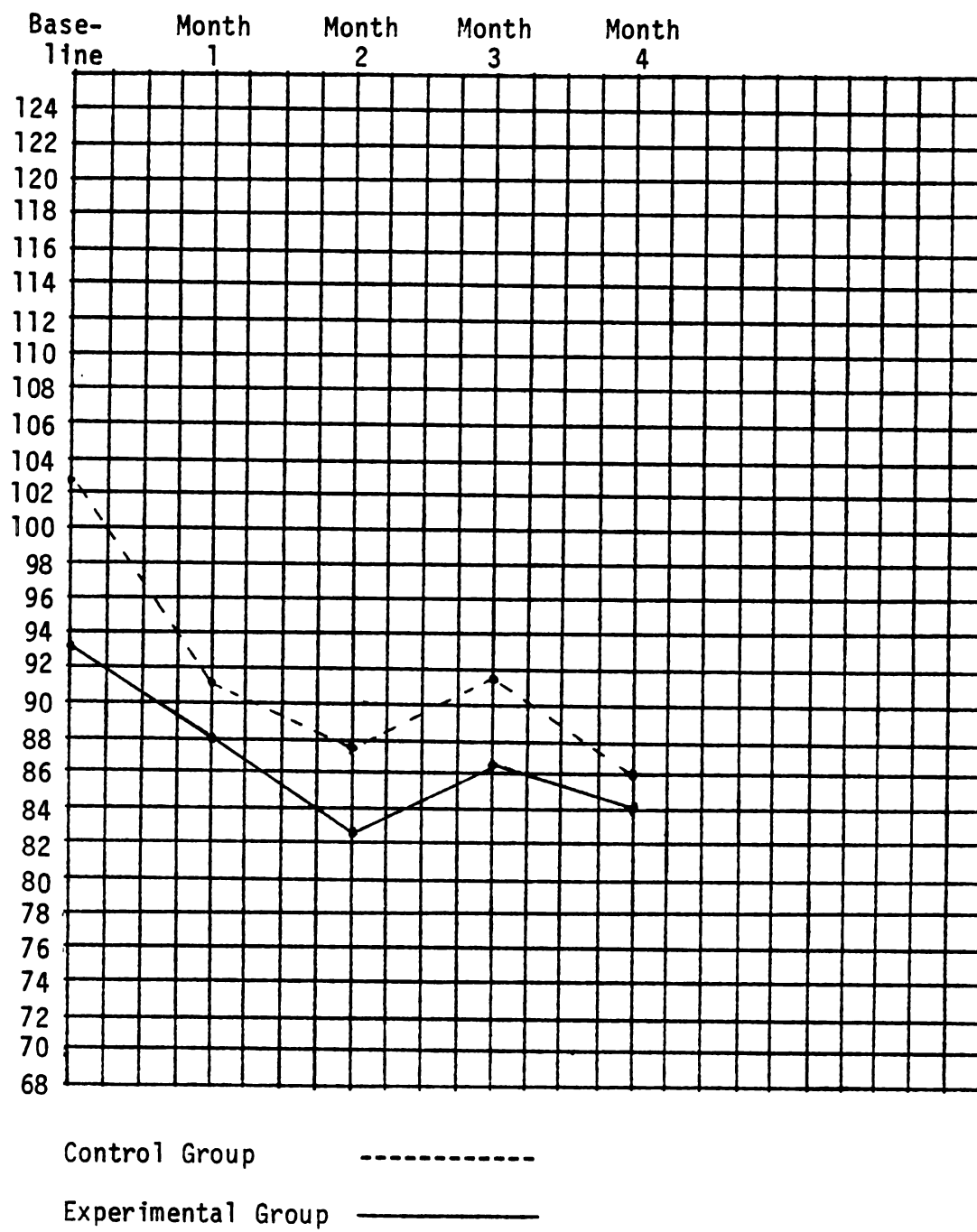
In summary, the analysis of the data indicates that none of the four hypotheses was accepted. It appeared, in fact, that although there was no statistical difference in the groups after the baseline measurement, there was a greater decrease in the control group than in the experimental group (See Tables 5 and 6). This would indicate that the refresher class did not contribute to a decrease in diastolic pressure.

Table 5

Average Change in Diastolic Pressure
Each Month in Individual Subjects

	Subject I.D.#	Amount and Direction of Change
Experi- mental	1	- 4.1
	2	- 4.1
	3	- 3.1
	4	- 2.3
	5	+ 2.1
Control	6	- 4.6
	7	- 5.5
	8	- 7.5
	9	- 1.4
	10	+ 0.2

Table 6

Comparison of Mean Diastolic Pressure of
Control and Experimental Groups

Chapter 6

DISCUSSION

Examination of Intervening Variables

A major disadvantage of a time series design is that the very nature of the design provides the opportunity for intervening variables to occur. This study took place during a five-month period of time. There were a number of stressful events which occurred in the lives of the people in both groups. In the experimental group, one man was rather suddenly transferred to West Germany, and a woman was both involved in an auto accident and experienced a death in her family. In the control group, one man was involved in an auto accident and was off work for six weeks while he recovered from his injuries. Another man sold his home and was in preparation for a move to another city. A third man was involved in some sort of family crisis, which was quite upsetting to him, but which he chose not to share with the investigator.

Some subjects in both groups also began to change their life styles in areas other than the relaxation exercises. One man in the experimental group began jogging regularly. He also attended a local university in the evening and took a class in stress-reduction. The class required daily practice of a relaxation exercise very similar to the exercises he was expected to perform regularly as a part of this study. The class seemed to provide increased reinforcement for his continued practice of the exercises.

In the control group one man also began to jog regularly. A very obese woman joined Weight Watchers and lost 20 pounds in two months. She also began a regular exercise program consisting of a daily walk.

The intervening variable which probably had the greatest effect was the presence of the investigator in both groups. The design of the study called for the investigator to be present only during the initial four-week session and for each of the monthly refresher classes. The measurements were to be made by an assistant who would be unaware of the differences between the control and experimental groups. However, difficulties were encountered in finding a reliable assistant to measure the blood pressures, and the decision was made that the investigator obtain the measurements herself. This allowed the investigator to make home visits to all of the subjects each month for the four monthly measurements. During this time, relationships developed between the investigator and each of the subjects. The relationships tended to be more positive with subjects in the control group. During these visits, the subjects appeared genuinely pleased to see the investigator. They usually volunteered much discussion regarding how they were feeling and what had gone on in their lives during the past month. They also asked about the other members of the classes. Families seemed quite involved in the visits also. In one family the children usually were gathered around as their father's blood pressure was being measured. One night they shyly asked if the investigator would measure theirs. Positive feelings were expressed by one of the wives who said, "You sure must care a lot to come all the way out here just to do this."

The relationship with the experimental subjects did not seem quite as positive as with the control subjects. Only two of the five subjects

practiced the technique regularly, and these same two were the only ones who attended all three refresher classes. The three remaining subjects in the experimental group seemed to lose their enthusiasm for the study. The motivation to practice regularly and attend the refresher classes seemed to decrease as time passed. Interestingly enough, two of these three appeared to be the most highly motivated in the beginning. Both had rather high initial diastolic pressures (100 mm Hg and 92 mm Hg). One had recently learned that he would soon be transferred to West Germany. He was so desirous of being in the study that he volunteered to have his blood pressure taken there and to have the results sent to the investigator. The other subject was being evaluated for antihypertensive medication by his physician. He stated that he had told his physician that whatever the decision regarding medication, he wanted to try the relaxation exercises first and would delay starting medication until he had given the exercises a fair trial.

The relationship between the investigator and these three experimental group subjects was cordial and friendly but somewhat less open than with the control group subjects. The question of guilt arises. Did the subjects feel somewhat guilty for having agreed to participate fully in the study, i.e., attending classes and practicing regularly, and then not following through? They seemed rather unwilling to discuss their practice or meeting attendance. When asked about practice, they usually laughed nervously and said they hadn't been practicing or hadn't practiced regularly. They usually said they had forgotten about the class meetings, even though they had been telephoned or sent a post-card reminding them of the meeting.

If these subjects were feeling somewhat guilty, it may have been related to what they perceived as their failure to fully participate in the study. The fact that they were expected to perform an extra task — attending the three refresher classes — may have been perceived as an extra burden that the control group was not expected to perform. It was therefore easier for the experimental group subjects to fail to complete all the functions of the project than for the control group subjects. This may have contributed to feelings of guilt among the members of the experimental group. However, with such a small sample, this can only be a speculative observation, and certainly not a conclusion.

One possible reason for reluctance to attend the refresher classes was because the classes were so small. It even seems questionable to refer to them as classes, when at two of the classes there was only one subject in attendance. Individual sessions might be more appropriate designations. Since there were only five experimental group subjects in the entire sample, and they attended two different three-month refresher sessions, one session had only three members and the second one had two. Since the classes were very small to begin with and then were poorly attended, the subjects may have felt uncomfortable in such a small group. One subject expressed discomfort by saying several times during a class in which she was the only attendee, "Isn't anyone else coming tonight?" She also commented repeatedly that it was a shame that the investigator had to "come all this way just for one person." In another class with only one attendee, the man laughed after hearing the investigator refer to the class as a "group," and said, "Gee, I never thought of myself as a group."

It is also possible that attending classes regularly forced the subjects to remember that they had a chronic health condition, which they may have preferred to deny. (Crate, 1965, and Engel, 1964) Although this would have been true to some extent for both groups, the experimental group was expected to attend seven classes, compared to only four for the control group. The length of time the experimental group was expected to attend classes was four months, compared to one month for the control group. The increased amount of time and participation for the experimental group may have allowed more time for ambivalent feelings regarding their illness to develop.

As the results of the study were inconclusive, it was impossible to draw any conclusions regarding any possible benefit of a refresher class on the process of retention of a learned technique. The very tentative results would indicate that perhaps the refresher class was not a helpful adjunct to the learning process. However, this would need to be studied again with a much larger sample.

A most interesting finding of the study was that there was a definite decrease in blood pressure among eight of the ten subjects. The intervening variable which was in effect with all the clients was the presence of the nurse-investigator. The nurse-investigator met and interviewed the subjects, telephoned them several times while setting up classes, and assisted them in learning the relaxation technique and in attempting to become somewhat more aware of the stress in their own lives. She then continued to meet with the experimental group once a month for three months in the refresher classes. According to the original design of the study, her contact with the subjects would have ended at this point. However, due to the difficulty encountered in employing a reliable

assistant to visit the subjects in their homes and record their blood pressures, the nurse-investigator made the visits herself. This continued the personal contact with the subjects for a period of four more months. It was during this time that the investigator-subject relationships began to develop in a rather positive way. The subjects seemed to view the nurse-investigator as someone who cared about them and was concerned enough about their welfare to come to their homes every month to check on them. It would appear that the presence of a concerned person had a definite impact on the willingness of the subjects in this study to alter their lifestyles to deal with a chronic illness. This is an important area that should be studied more carefully.

Implications for Nursing Care

In this study it appeared that the presence of a concerned nurse had a positive effect on the willingness of the subjects to practice the relaxation techniques to decrease their diastolic blood pressure. It would appear that the continued relationship between the nurse-investigator and the subjects served as a positive reinforcement for the subjects to practice their relaxation techniques. Previous studies have shown the effectiveness of a public health nurse in maintaining treatment programs of patients with a variety of disabilities. (Ford, Katz, Downs, and Adams, 1971, Hanchett, Torrens, 1967) Ford et al. (1971) indicate that public health nurses were particularly effective in working with patients with mild to moderate disabilities. In this study the subjects were all mildly hypertensive and had little or no disability. Perhaps the presence of the nurse-investigator provided them with support as they

accepted the reality of a potentially serious chronic illness and began to adapt to it by modifying their lifestyles (Crate, 1965).

During the five months of the project, few of the subjects had any contact with a physician, and they seemed quite accepting of the fact that at this point their treatment program was directed by a nurse. All of the subjects' physicians were aware of their patients' participation in the study, as they had signed the subjects' consent forms at the beginning of the study. Although the fact that the project was not directed by a physician may have been responsible for some of the drop-outs, this possibility was not followed up and is an unknown factor.

It is important that the subjects had confidence in a nurse's ability to direct a treatment program for them. It appears that the teaching, counseling, and sympathetic support required in the long-term treatment of patients with chronic illness would be a very natural function for nurses to accept.

Limitations of Study

There were several serious limitations to this study. One severe limitation was the small sample size. This was due in a large measure to the time pressure to complete the study. Subjects were recruited from the multiphasic clinic during a two-month period of time. During one of the two months there were very few people who came through the clinic with a mildly elevated diastolic pressure. There was also an extremely high dropout rate at each phase of the project. Approximately 50% of the people interviewed qualified as subjects and indicated they would be interested in participating in the study. Approximately 50% of those

who indicated an initial interest were still interested weeks later when they were notified that a class would be starting. Approximately 50% of those who indicated they would like to join the class appeared at the first class, and only 50% of those who came to the first class returned to the second class. There were no more drop-outs after the second class, except for one woman who was started on antihypertensive medication. She completed the series of classes, but her data were not included in the results of the study.

The extremely high drop-out rate was probably due in large part to the length of time required for participation in the study. Another factor might have been the amount of involvement required from the participants. Some of the potential subjects may have felt it wasn't worth their effort. It would have been valuable to follow up on the drop-outs to discover their reasons for dropping out.

The high drop-out rate also contributed to another limitation of the study. The subjects became, in essence, a volunteer sample. These people were probably much more highly motivated than the people who dropped out earlier. This would have greatly reduced the generalizability of the study had there been significant results.

Another major limitation of the study was the presence of the nurse-investigator in measurements of the subjects. The possibility of investigator bias was present because the investigator was aware of which subjects were in which of the two groups. As the study was originally designed, the measurements would have been made by someone who would not have known the purpose of the study, or that there were two separate groups of subjects.

The investigator's presence also appeared to have a significant effect on the subjects, as was discussed earlier. Her presence seemed to create its own "Hawthorne effect." As this was an unexpected phenomenon, there was no provision made to control for it.

Suggestions for Future Study

As this study was a pilot study, there was an expectation that the full study would be done at a later time. A much larger sample and a reliable assistant to make the blood pressure measurements would be needed. The results indicated that there was a definite decrease in the blood pressure of the total group over a period of time. However, it still remains to be determined whether or not there would be any difference in blood pressure between those who had refresher classes and those who did not.

It would be interesting to extend the period of time the measurements would be taken, but once again this makes the project more involved for the subjects and creates the difficulties discussed earlier. If measurements could be collected for a longer period of time, the investigator would have the opportunity to observe whether or not the subjects continued to practice the relaxation techniques and receive the benefits from them.

The nurse-investigator's presence appeared to be such an important intervening variable in this study that it would be interesting to include it in the study and attempt to control for the effect. One possibility for this would be a 2 x 2 factorial -type design (Kerlinger, 1973, and Campbell and Stanley, 1963). In this design the subjects would

be divided into four groups — two attending refresher classes and two not attending refresher classes. A nurse could visit the subjects in one of the refresher groups and one of the control groups to make the measurements and to maintain contact. An uninvolved assistant could make the measurements of the other refresher group and the other control group. The design would be as follows:

	Refresher	Control
Nurse	NR	NC
Assistant	AR	AC

This design would control for the effects of both the refresher class and the intervention of the nurse. The disadvantage of this design is the need for a very large sample, which has already been shown to be difficult to obtain.

It would also be interesting to obtain more data about each subject at the beginning of the study by an in depth interview or a personality inventory. It is quite possible that personality factors are involved in the motivation required to make long-term lifestyle changes.

Chapter 7

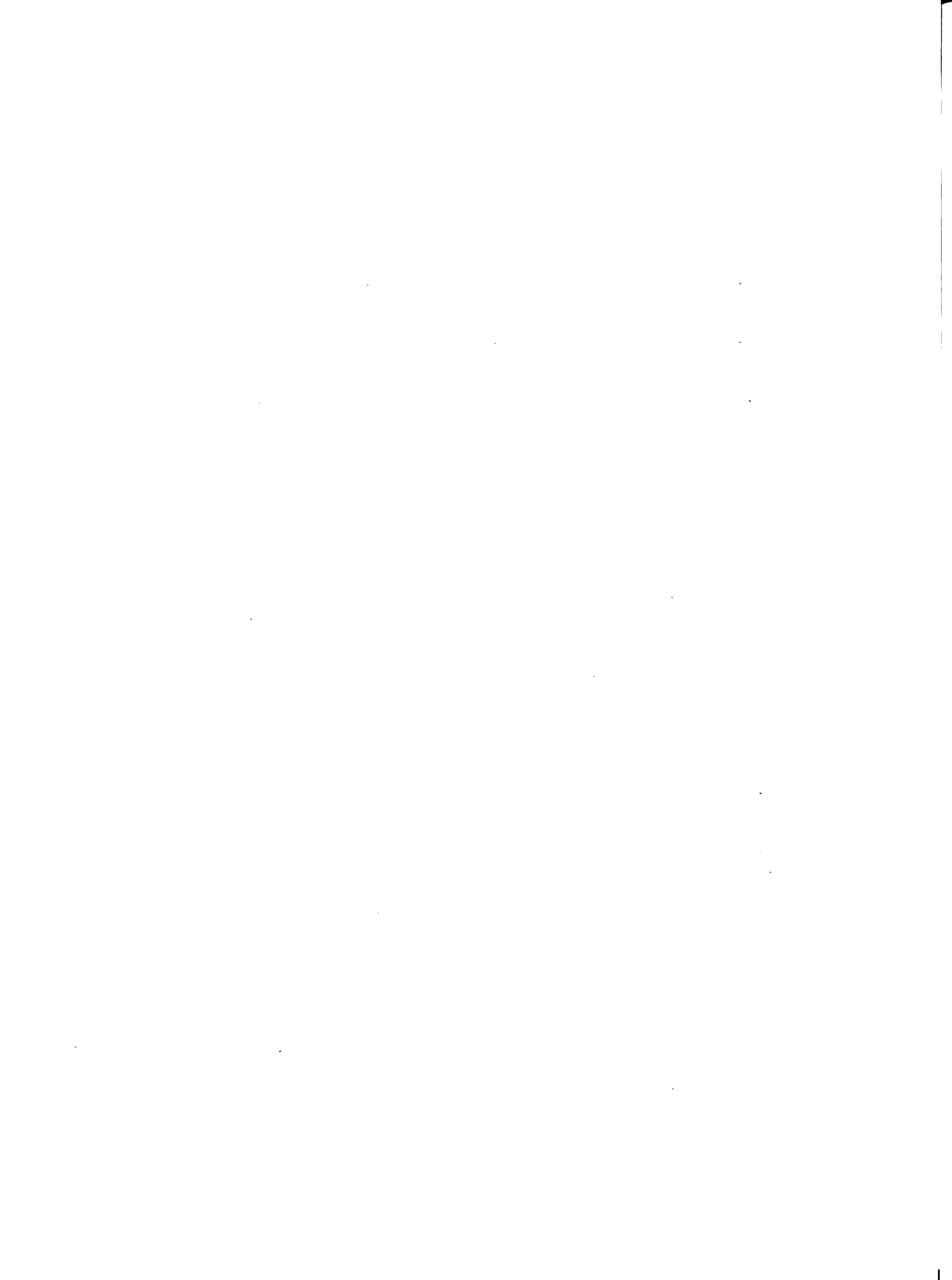
SUMMARY

This pilot study was conducted to determine the effectiveness of a refresher class on the learning process. The specific technique to be learned was a relaxation technique. A group of ten mildly hypertensive patients, those with a diastolic pressure of 85-100, was taught a relaxation technique described by Herbert Benson in his book The Relaxation Response. The course was taught in a series of four weekly classes. At the end of the series of classes the subjects were randomly divided into two groups — experimental and control. The experimental group was expected to attend a refresher class once a month for a period of three months. At the end of the basic series of four classes, all the subjects' diastolic pressures were measured by the nurse-investigator. They were measured again each month for the next four months.

The results of the study indicated that there was no significant difference between the diastolic pressures of the two groups at the conclusion of the study. Thus, it appears that the refresher class did not influence the diastolic pressure of the subjects.

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Appendix A

Description of Study

Description of Study

I am conducting a study on the effects of relaxation exercises on blood pressure. It has been proven in other studies that blood pressure can be decreased if relaxation exercises are practiced on a regular basis. I am conducting a study to see if relaxation exercises can decrease blood pressure over a longer period of time.

I will be teaching a class in relaxation techniques once a week for four weeks. This class will last approximately one hour and will be held in the medical clinic at Kaiser in Santa Clara. At the end of the class you may be asked to attend three additional classes which will be held monthly. Everyone in the study will have his or her blood pressure measured once a month. This can be done at the person's home by a health worker who will make home visits. These measurements will be done once a month for four months. This study is specifically designed for people whose blood pressures are only slightly higher than normal.

If you have any questions, I would be most happy to discuss them with you. Feel free to call me.

Thank you.

Carol Ruff

Appendix B

Blood Pressure and Relaxation Chart

Appendix C

Demographic Data

Demographic Data

Name _____
Address _____

Telephone _____
Birthdate _____
Kaiser # _____

Age _____

Sex _____

Race (Check one) Caucasian
 Black
 Mexican-American
 Oriental
 Other

Marital Status (Check one) Single
 Married
 Divorced or Separated
 Widowed

Employment Status (Check one)
 Employed
 Unemployed
 Retired

Appendix D

Consent to be a Research Subject

Consent to be a Research Subject

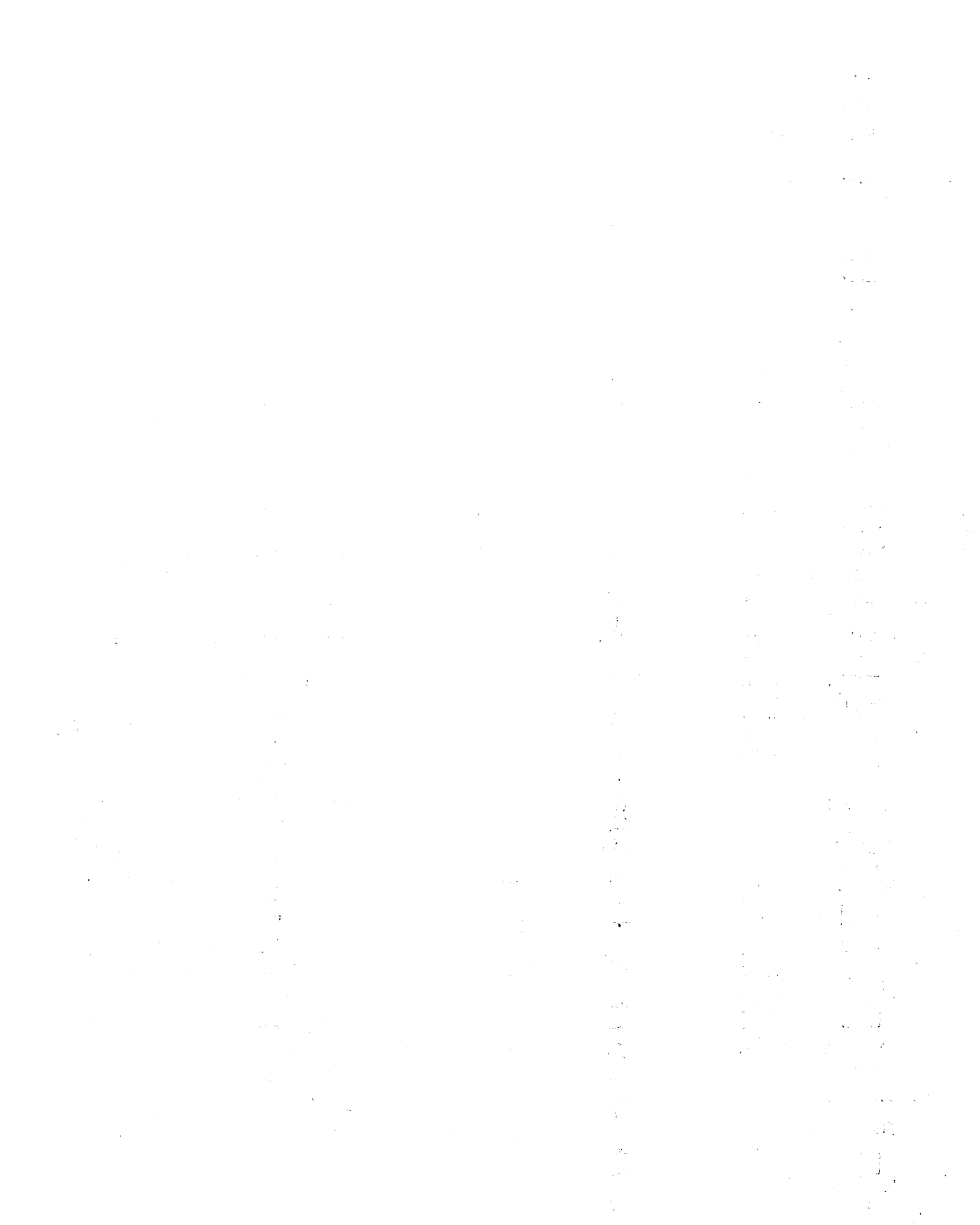
1. I agree to be included as a subject in a research study. As a subject, I will participate in a class to learn and practice a relaxation technique, known as the Relaxation Response.
2. This procedure will take approximately 20 minutes of every day, and I will agree to attend a one-hour class each week for four weeks. This class will be held at Kaiser Hospital in Santa Clara. At the end of this class, I understand that I may be selected at random to continue meeting once monthly in a one-hour class which will continue for three months. I also understand that I will be visited monthly by a health worker who will measure my blood pressure. These monthly measurements will be done for a period of four months following completion of the four-week class.
3. I understand that the purpose of this study is to determine if blood pressure can be lowered by regularly practiced relaxation techniques.
4. I have been told that the procedures involved in this study may be an inconvenience to me, as I will be expected to perform the techniques for a 10-20 minute period each day, and to keep a daily record of my practice.
5. I have been told that the regular practice of this relaxation technique may result in a lowering of my blood pressure. If this treatment proves to be effective in lowering blood pressure, it could be used for other people with high blood pressure.
6. This information has been discussed with me by Carol Ruff, who is a graduate nursing student at University of California, San Francisco. She will answer any further questions I may have concerning this study. I can reach her by telephone.
7. I recognize that my participation in this study is voluntary. I am free to refuse to take part in it or to withdraw from it without any jeopardy to my treatment. The investigator also has the right to drop me from the study.

Subject's Signature: _____

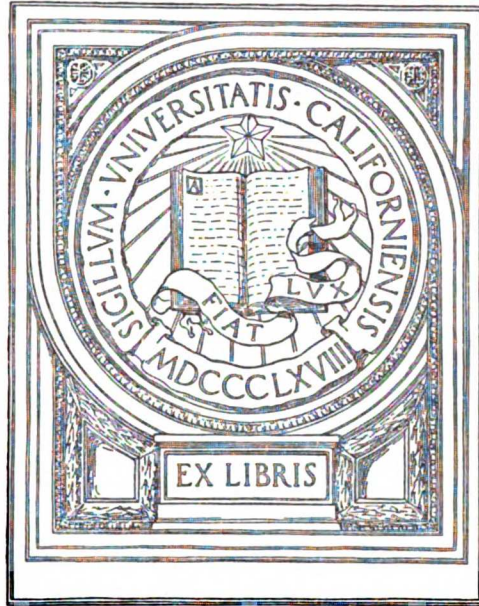
Date: _____

Attending Physician's
Signature: _____

Date: _____



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