THE RELATIONSHIP OF BLOOD PRESSURE LEVELS TO THE CHRONIC INHIBITION OF AGGRESSION

Thesis for the Degree of Ph. D.
MICHIGAN STATE UNIVERSITY
Robert George Meyer
1967

This is to certify that the

thesis entitled

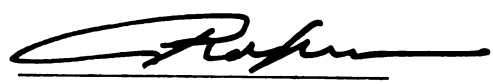
THE RELATIONSHIP OF BLOOD PRESSURE LEVELS TO THE CHRONIC INHIBITION OF AGGRESSION

presented by

Robert George Meyer

has been accepted towards fulfillment of the requirements for

Ph.D. degree in Clinical Psychology



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Date May 14, 67

ABSTRACT

THE RELATIONSHIP OF BLOOD PRESSURE LEVELS TO THE CHRONIC INHIBITION OF AGGRESSION

by Robert George Meyer

Several investigators have suggested that the inhibition of aggression may be related to chronic high blood pressure. Studies of the etiology of essential hypertension also lend credibility to such a hypothesis. Recent investigations support this hypothesis in regard to short-term effects, and have in addition indicated that guilt over the expression of aggression is a relevant personality factor related to high blood pressure.

Anokhin asserts that the depressor impulses that act to lower blood pressure can only fire consecutively for approximately 25 minutes, and if felt aggression is suppressed beyond that time, the vascular system slowly adjusts itself to a higher level of blood pressure. The cortex, as well as the hypothalamus and reticular formation, play important parts in his theory, and fit with hypotheses using higher-level constructs such as "guilt" and the "suppression of aggression."

This study is naturalistic-statistical in approach in order to most effectively study the chronic effect of the non-expression of aggression in human subjects. As mentioned, while other studies have shown short-term effects, chronic effects have yet to be clearly demonstrated. For this reason, observations were made on inmates of the State Prison of Southern Michigan who had served at least two years time previous to the initiation of this study. Reliable records on relevant variables were available.

Inmates aged 23 to 35 were included only if the offense resulting in the most recent incarceration had involved direct physical aggression. These inmates were categorized into low and high aggression groups, depending upon their behavior pattern during their institutionalization. They were also matched on the relevant factors of age, weight, race, and prior medical history.

Sixty-eight subjects (thirty-four in each group) were examined. Ten minutes after a preliminary blood pressure was taken, two blood pressure measures were taken fifteen seconds apart, and the Mosher Incomplete Sentences Test was then admistered to assess the amount of guilt over the expression of aggression. The Cattell 16 PF was also administered in order to obtain both anxiety and intelligence scores.

An average of the last two blood pressures taken on each subject was used, in order to increase the validity of the measure. The MIST responses were rated for aggression-guilt. The reliability of such rating has been previously established. Anxiety and intelligence scores were assessed according to the instructions in the Cattell 16 PF Manual.

The primary hypothesis, that subjects who for the 18 months prior to the study expressed little aggression would have significantly higher diastolic pressures than subjects who continued to aggress substantially, was supported at the .01 level of confidence. The second main hypothesis, that within the high aggression group, those who manifested high guilt over the expression of aggression would have significantly higher diastolic pressures than those who showed low guilt, was significant at the .025 confidence level.

A similar though not significant trend was found when systolic measures were employed.

The two groups were not found to be significantly differentiated by any Cattell scale, including anxiety or intelligence scores. Though Negro subjects had a slightly higher mean diastolic blood pressure than whites, this difference was not significant.

The results led to the following conclusions:

1. A continued state of the non-expression of aggression, in those men who have at one time expressed direct physical aggression, results in higher levels of diastolic blood pressure than in those men who continue to aggress against the environment.

2. Within that group of men who continue to aggress against the environment, those who have guilt over such expression develop higher blood pressure than those who do not have such guilt.

3. Self-reported anxiety, or other Cattell personality dimensions, are not related to the raising or lowering of diastolic blood pressure levels, or to the expression of aggression.

THE RELATIONSHIP OF BLOOD PRESSURE LEVELS TO THE CHRONIC INHIBITION OF AGGRESSION

By

Robert George Meyer

A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Psychology

1967

746125
9-21-67

ACKNOWLEDGMENTS

I wish first of all to sincerely thank Dr. Albert I. Rabin, my dissertation chairman, for his advice, support, and guidance in this endeavor. His criticisms were always both fair and meaningful, and his interest has always been consistent and very supportive.

My thanks are also extended to Dr. Bill Kell for his criticism and support in this work, and for his help in the latter years of my graduate studies. A special note of thanks is extended to Dr. Joseph Reyher for his assistance in this project and while serving as my advisor over the years, and to Dr. Bertram P. Karon, who has been an unfailing source of constructive advice and vital encouragement throughout all my years of graduate study.

My appreciation is very strong toward those inmates who gave of their time to help in this study. Most especially, I wish to thank Mr. Robert Hearn, who ran the subjects and assisted in the statistical computation, and Mr. Harvey Webb, who typed the drafts and revisions.

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CHAPTER I

INTRODUCTION

Psychosomatic Background

This paper is concerned with the possible effects that psychological factors, such as the chronic inhibition of aggression and guilt over the expression of aggression, exert on blood pressure levels. Studies carried out on the psychosomatic disorder designated "essential hypertension" will also be examined since chronic high blood pressure is the primary sympton of this disorder.

The use of the term "psychosomatic" has increased rapidly throughout the last several decades. It is not only a core concept of current psychological research, but has infiltrated with varying degrees of accuracy into contemporary intellectual discussions. A proliferation of research has paralleled this growing familiarity with the concept.

Two converging factors have paved the way for this quick rise. The acceptance of the psychosomatic approach was in part a consequence of World War II, a factor of generative import for many areas of psychological research. During World

War II, the psychosomatic effects of high and prolonged anxiety were clearly apparent to many men under stress, as well as to those attending them (Groen, 1964).

The second and more important factor was an increment in sophisticated research literature. The landmark work was that of W. B. Cannon (1932), which provided a theoretical basis for much of the research in psychosomatics.

A basic assumption as to what a psychosomatic disorder consists of has gradually evolved. The consensus is that the term "psychosomatic" should be limited to those disorders in organs or systems controlled by the autonomic nervous system in which chronic emotional maladjustment is the primary factor and somatic dysfunction is the result or by-product. The term "somato-psychic" is then employed for those disorders in which the bodily change is primary to the psychological one, e.g., as in tuberculosis.

Groen (1964) is most emphatic in distinguishing the two categories; however, there is little consensus as to which disorders fall into which category. For instance, while Groen sees the somatic dysfunction as primary in rheumatoid arthritis and asthma, many people would postulate the psychological aspects as more important in these disorders. There are important and relevant anatomical and physiological considerations that should

be mentioned concerning psychosomatics in general and, as such, are pertinent to the particular focus of this paper.

Physiological Considerations

The general concept of "psychosomatic" refers to somatic disorder in organs or systems controlled by the autonomic nervous system, and thence subordinated to the higher brain areas, e.g., the cerebral cortex. The autonomic nervous system enervates all the nonstriated muscle and the glands, which are not under the voluntary control of the cerebral cortex. It is usually referred to as the involuntary or vegetative nervous system, and is functionally defined as that system of motor nerves which oversees the interacting internal affairs of the organism (White and Smithwick, 1941). These authors state that it was Claude Bernard, the great French physiologist, who first pointed out that it is the mammals' constant preservation of a "milieu interieur" which is a determining factor in a free and an independent life from the general environment. The autonomic nervous system is the basic functional factor providing this independence.

The autonomic system is basically divided into the parasympathetic and sympathetic sub-systems, a division based on anatomical and physiological factors. There is no fundamental difference between the sympathetic and parasympathetic systems

in terms of either neuron and ganglionic structure. The important anatomical distinction is the location of the ganglia, the ganglia of the sympathetic division lying in closer proximity to the spinal cord.

Physiologically, the sympathetic system acts in a more general and diffuse manner than the parasympathetic division. Gellhorn and Loofbourrow (1963) comment that partial sympathetic discharges can occur, although the basic fact remains that irradiation to a number of effector organs from one stimulation is much more common in the sympathetic system than in the parasympathetic system. Parasympathetic discharges are physiologically specific.

The sympathetic system is functionally concerned with mobilizing the resources of the body for use in work or emergencies. It is an emergency protective mechanism, which, while often dormant, is always ready to take action to remedy various circumstances such as hemorrhage, as well as intense emotional or psychic trauma. An important point in this regard is Cannon's (1932) discovery that once the sympathetic system has been aroused, it is very important that some form of activity be carried out, to complete the system's cycle once it has been begun. Therefore, one must either permit excitement to find an appropriate physical mode of expression in order to obviate the harmful effects of

continued arousal. Cannon has emphasized that if the emotion is once set in motion, the best thing that can be done is to engage in strenuous physical exercise if it is not to be allowed expression.

The function of the parasympathetic division is the conservation of bodily resources. It dominates the bodily functions during the time when the organism is recuperating. For example, it slows the heart rate, thereby allowing rest for cardiac muscle.

These are not truly separate divisions of the autonomic nervous system; rather they both act in terms of a balance effect. The organism is operating optimally only when these two divisions interact in tune with each other. For example, if the organism is to react effectively after a strong emotion has activated the sympathetic system, a rise in parasympathetic activity must soon follow the sympathetic discharge.

This balanced opposition and dual enervation underlies Cannon's (1933) very important concept of "homeostasis." Homeostasis is the designation for the coordination of the body by means of autonomic adjustments through which changing conditions in the environment, both external and internal, are dealt with. It frees the individual from having to pay detailed attention to the very routine and minute aspects of everyday life.

Psychosomatic abnormality is then a breakdown of the normally efficient homeostatic mechanism. This breakdown can

in some instances be termed "normal." Chronically cold feet or moist hands are examples of a breakdown of homeostatic control in the normal person. In psychosomatic conditions, the disruption of the homeostatic balance occurs in a more abrupt or definite manner than in the examples cited above.

The cerebral cortex is the agent providing the chronic inhibitory effect that interrupts this normally efficient autonomic cycle. White and Smithwick (1941) refer to several studies and conclude from them that chronic vasoconstriction is often produced through the interruption of the autonomic cycle by inhibitory impulses from the cortex to those vasoconstrictor centers in the hypothalamus and the medulla.

Likewise, a local stimulation of the paraventricular nuculei in the walls of the third ventricle of the hypothalamus results in a widespread discharge of sympathetic activity with such characteristic responses as a rise in blood pressure, cardiac acceleration, erection of hairs, etc. The hypothalamus connects with cortical areas, as well as with the pituitary gland, mainly the posterior lobe, and with the reticular activating system.

The hypothalamus is central, anatomically, in this conceptualization. However, the reticular activating system is of primary functional importance since, as Gellhorn and Loofbourrow

(1963) have commented, it is primary to the continued activation of a system and this continued activation is precisely that which eventually upsets the autonomic balance, leading to a "higher level of balance." The hypothalamus provides the anatomical mediation, the reticular activating system (RAS) provides for the continued arousal, and the cerebral cortex is the agent for disruption of the cycle.

Anatomical Considerations

There are several psychosomatic-anatomical aspects relevant to blood pressure hemodynamics. Brod (1961) points to a prime hemodynamic difficulty in conceptions of essential hypertension, as well as in other cardiovascular stress reactions. An increase in cardiac output and a low total peripheral vascular resistance are found in acute emotional stress, whereas in high blood pressure a virtually normal cardiac output with increased total peripheral vascular resistance is typical.

Brod found the hemodynamic response to emotional stress in all subjects was similar to the hemodynamic response to severe muscular exercise, and stated there is a similar significance for both, i.e., preparing the organism for "fight or flight." He concludes that the normal cardiac output and increased peripheral vascular resistance in essential hypertension are a result

of chronic stress, representing a state of fixed preparedness for a severe muscular process that never takes place.

The internal radius of the blood vessel, as well as the vessel wall thickness, should not be conceived of as important only when "abnormally defective," but rather normal, genetically-inherited aspects that do influence blood pressure. However, these factors are neither primary nor effective, as Peterson (1961) states, unless there is a concurrent and primary influence of emotional factors. The vessel wall itself naturally resists being stretched, although it is in a state of at least minimal stretch at all times. The stretching acts on the baroreceptors, the nerve ends which are embedded in the vessel wall, as e.g., the carotid sinus. Stretching the wall in turn stretches the carotid sinus which relays impulses through the autonomic system and initiates a parasympathetic discharge which in turn acts on heart rate. In In this sense, the carotid sinus acts as a strain receptor as opposed to the common conception of it as a "pressure" receptor. It becomes the effector organ within the blood vessel itself. The general mechanics of this cardiovascular regulation process are diagramed on the following page. (See Diagram 1.)

As the strain in the vessel wall increases, the nerve impulse traffic increases, and as the impulses from the various receptors increase, the parasympathetic activity affecting the

heart and the blood vessels likewise increases. The center for the integration is hypothesized as being the hypothalamus (Gellhorn and Loofbourrow, 1963).

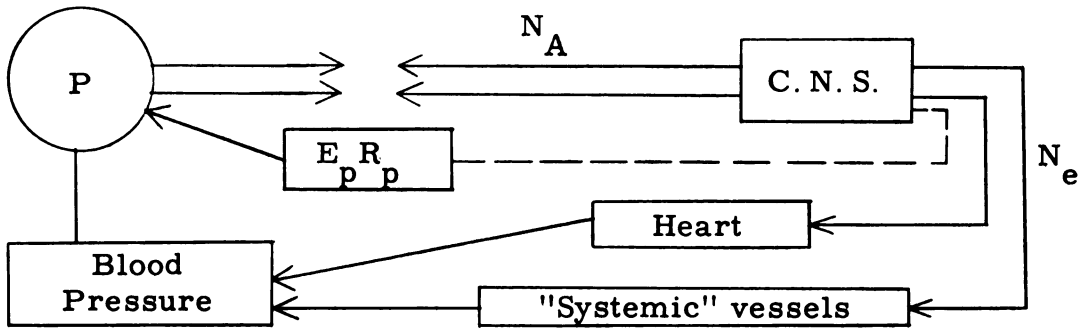

Diagram 1. -- Schema of cardiovascular regulation. The circle represents a blood vessel whose wall contains receptors such that the vessel wall varies with intravascular pressure (P). Afferent nervous activity (N_A) from these receptors is transmitted to the central nervous system (CNS). Efferent nervous activity is labeled N_e. Dotted line represents efferent nervous activity which effects changes in the vessel walls. From L. Peterson (1961), p. 306.

Prominent Theories

There are two general camps of theorists on the genesis of chronic high blood pressure. The first hypothesizes physiological factors as prominent, with psychological factors occurring in an epiphenomenal sense. The other is psychological-emotional in emphasis, high blood pressure being primarily determined by the psychological factor. The cause in the latter approach is typically considered to be emotional stress per se.

Cottrell (1961) points out that conceptualizations of essential hypertension as deriving from physiological factors have fallen by the wayside much as the peeling of leaves off of an artichoke. Cottrell sees the first leaf to be pulled off as that of unilateral renal disease, as promulgated by Harry Goldblatt. The other leaves would be those of primary aldosteronism,[1] aortic coarctation,[2] and chronic pyelonephritis,[3] leaving the conception of essential hypertension not as an entity, but rather as a hypothetical construct.

The one physiological theory which has always received attention, and which still does, contrary to Cottrell, is the renal or reno-humoral theory which has consistently been linked with the name of Harry Goldblatt. All theorists would agree that some cases of hypertension are secondary effects of renal failure. The distinguishing mark of Goldblatt's theory is his assertion that all cases of hypertension are primarily derived from renal factors. As Stamler in his discussion of Selye and Bayusz's (1961) paper has asserted, several points must be established before the renal theory can be accepted. First, the problem of the etiology and pathogenesis of nephro-sclerosis would need to be solved, and

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[1]Chronic hypertension of the adrenal cortex.

[2]Constriction of the aorta.

[3]Chronic inflammation of the kidney.

this is a virtually unexplored problem. Secondarily, it must be proven in humans that the renal vascular disease process is prior to the hypertension. Anokhin (1961) has stated that in the majority of cases it is clearly the other way around.

The term hypertension therefore covers two separate entities. The first is renal hypertension, where the hypertension is a secondary outcome of a renal arterio-occlusive disease. In the discussion of Pickering's (1961) paper, Corcoran has estimated that the frequency of renal arterio-occlusive disease in an unselected hypertensive population is somewhere along the order of one percent. While certain authors claim this figure should be something like 25 percent, he notes that these samples are usually composed of referrals on that small portion of symptomatic hypertensives who came for treatment, were selected for aortograms, and who showed positive findings.

The hemodynamic response to a specific stress includes a blood pressure rise via a strong rise in the total peripheral vascular resistance in the kidneys and skin. This explains the occurrence of renal failure in longstanding cases of hypertension as a secondary phenomenon. It is the result rather than the cause.

Psychological Factors and Hypertension

There have been various approaches throughout the years which have linked high blood pressure to personality types or

differing modes of emotional expression. The first published research on psychological factors and blood pressure in American psychology has been credited by McGinn, et al. (1964) to W. M. Marston (1917). Marston, a Massachusetts lawyer rather than a psychologist, was interested in the physiological changes accompanying the process of deception. After he gave the subjects one or two facts, they were asked to make up lies surrounding these facts. These "lies" were to be mixed in with "truths." Systolic blood pressure measures were taken and were correlated with the subject's report of whether he was telling the truth or attempting to deceive the experimenter at that particular time. Marston found that it did not matter what the actual facts were, as long as the subjects thought they were deceiving him, their blood pressures rose. When they thought they were telling the truth, their blood pressures decreased.

Several psychoanalysts have correlated interviews involving stressful or conflict-laden material with blood pressure readings. The most notable here is that by Saul (Alexander and French, 1948), who reported observations of blood pressures before and after psychoanalytic sessions. He found that whenever unperceived resentments were coming to the fore, though not yet in consciousness, the blood pressure levels would fluctuate up to 30 or 40 points. This rise would persist as long as there was

any material associated with these unverbalized conflicts. It was only after a time in which the person could discuss freely these unsatisfied resentments that the blood pressure would subside.

Psychological test data

Other psychological indices such as objective and projective tests have been used to study the correlates of high blood pressure. Cattell and Scheier (1959) attempted to relate various Cattell 16 PF factors with changes in systolic blood pressure. They took for their sample 18 University of Illinois undergraduate males, the top ten percent from the 180 who originally took an IPAT Anxiety Scale. They tested this obtained sample on 103 variables, including 33 questionnaire scales. Those who had high systolic blood pressure along with the high anxiety were found on the 16 PF to be sociable, group dependent, sophisticated, practical or conventional, and submissive interpersonally.

Brower (1947) studied the relationship of blood pressure to performance on the Rorschach test. He individually administered the Rorschach to 38 undergraduates, as well as the Mirror Drawing Test and an MMPI. He also measured their pulse rate and the diastolic blood pressure, asserting that the systolic blood pressure is a composite score and therefore inaccurate. He found that those with a higher diastolic blood pressure had a lower FC score on the

Rorschach, which he interprets as the degree of emotional adjustment to outer reality. The results are "suggestive," to use his own term. Other researchers (Matarazzo, 1954; Neiberg, 1957) have employed the TAT, the Rosenzweig Picture-Frustration Study, etc., with little or no significant results in clarifying the variables in chronic high blood pressure, at least as regards the psychological test results.

Hamilton (1942) administered self-rating scales and peer-rating scales, as well as a Rorschach and a Murray Picture Test, to 130 subjects. They correlated these scales and tests with extensive physiological measurements and life history data that were gathered as a matter of routine procedure for admission to the educational institution involved. The study employs fairly rigorous controls, but they used only the systolic pressure for comparison to other measures. Their reasoning for not employing the more relevant diastolic pressure, i.e., statistical ease, seems very inadequate. They did not find those with high systolic pressure to be neurotic, unstable, or physically hyperactive; although they stated these high systolic pressure subjects were more easily aroused to anger. Yet, on all rating scales they came out significantly more submissive than normals in spite of their low threshold for anger arousal.

There are, of course, studies (Oken, 1960; Storment, 1951; Innes, Millar, and Valentine, 1959) which have found no differences in scores on personality tests or reactions to stress interviews between high and low blood pressure samples. As McGinn, et al. (1964) conclude, these studies do not refute the hypothesis of consistent personality correlates to blood pressure changes, as there is much reason to question the theoretical methodology and/or statistical approaches employed.

Theoretical Orientation

The quantity of stress theory

This section will attempt to integrate the various findings and principles discussed in the previous sections of this paper, in order to present a meaningful theory of the development of chronic high blood pressure. A prior section of this paper verified the feasibility of a theory based on emotional factors. However, this trend of thought needs further refinement. Is it the quantity of emotion that leads to high blood pressure, a particular emotion, or a mode of reaction to emotional arousal?

A prime psychosomatic theory of essential hypertension holds that it is the quantity of stress per se that is causal (Brod, 1961). Most support for this view has come from animal experiments. Selye and Bayusz (1961) have experimentally developed

hypertension in rats by exposing them to loud noises at frequent intervals over a long period of time. John Calhoun (1962), in a rigorously-defined procedure, found that crowded living conditions as a stress situation produced cardiovascular pathology in rats.

These studies do not definitely support a "hypertension results from stress per se" hypothesis. One still wonders whether it is the stress or the emotional reaction induced by such a stress which is the causative factor. Results from other studies (Shapiro and Horne, 1955) would, in fact, argue against the idea that stress in a quantitative sense directly correlates with the development of high blood pressure.

Specificity

Stress as a quantity is not the important factor; rather it is the organism's handling of the stress. The next question: which emotion is causal? This implies a prior logical point, the problem of "specificity." This refers to the question whether emotional states can, in fact consistently be differentiated, i.e., along physiological lines, or whether particular persons react similarly regardless of the particular eliciting stimulus. In regard to this paper, are circulatory response patterns specific to the particular individual in question regardless of the emotion elicited, or is the circulatory pattern more related to the particular emotional state?

As Gambaro (1966) implies, the former notion follows Cannon's idea that one cannot discriminate the various emotion states in terms of the physiological changes. For example, these physiological aspects would be the same for both fear and anger under this hypothesis. Lacey (1952) and Lacey, Bateman and Van Lehn (1953) are modern proponents of this view that response patterns are differentiated in terms of the particular responding individual rather than the eliciting stimuli.

McGinn, et al. (1964), Buss (1961), and Gambaro (1966) all cite evidence from which they conclude there is significantly stronger support for the hypothesis that the circulatory response patterns are directly and consistently related to the particular emotional state which is elicited. The two studies which offer the most definitive support in this regard are those by Ax (1953) and Schachter (1957).

Granted that specific emotional reaction patterns can be differentiated, which particular emotion is the factor in high blood pressure? Aside from anger, fear is the only emotion to have either face validity or theoretical backing as the specific underlying emotion. Ax's (1953) and Schachter's (1957) results on diastolic blood pressure contraindicate fear and support anger as the underlying emotion. Evidence from such diverse sources as

Saul (1948) and Groen (1964) lend support to an anger or aggression-based hypothesis.

Directly relevant is a series of studies carried out by Hokanson and his colleagues (Hokanson, 1961; Hokanson and Burgess, 1962 [a]; Hokanson and Burgess, 1962 [b]; Hokanson, Burgess and Cohen, 1963), focusing on the expression of aggression. In this series of studies, 80 students were typically involved in various factorial designs. Several variables were manipulated, and the variations in frustration involved the type of harassment employed while subjects attempted to count backwards from 100 to 0. These experimenters repeatedly found the frustrating condition to cause a significant rise in systolic blood pressure. An important finding was that aggression against the frustrator himself significantly lowered blood pressure, whereas aggression against a "substitute" was not significantly effective, and blood pressure remained somewhat elevated.

There are two main weaknesses with these studies. The first, which should have been eliminated, was the exclusive use of the systolic pressure measure, as opposed to the more relevant and reliable diastolic measure. The other problem variable was the use of such an elicited, explicitly "socially-sanctioned" aggression situation, where the subject was given the message that he was helping the experimenter (E) study the effect of pain

on guessing behavior by shocking him when E was wrong in guessing a number. This unique situation for the expression of aggression obviously limits the generalization of results.

The central factor in this inhibition of aggression was hypothesized by Gambaro (1966) to be guilt over the expression of aggression. As mentioned previously, Gambaro (1966), using the Mosher Incomplete Sentences Test (MIST) (Mosher, 1961), found that both high and low guilt groups showed similar blood pressure increases in an anger-inducing situation. Also, only those Ss with low guilt showed a significant decrease in diastolic blood pressure when allowed to aggress. Since aggression will be the main independent variable, a later section of this paper will examine it in more detail.

The following will present physiological theory and data necessary to support an aggression-inhibition hypothesis. A rise in blood pressure is quickly communicated in the form of nervous information to the central nervous system from the sensitive baroreceptors in the aorta and the carotid sinus. Anokhin (1961) has demonstrated that a rise in afferent signals from the baroreceptors in the aortic arch occurs immediately upon a rise in blood pressure in the aorta, and that these impulses can increase by several orders in magnitude. These impulses then converge on the vasomotor center where the tone of the vascular system is determined.

Anokhin has also shown that if systolic blood pressure rises above 170 mm. Hg. from some form of stimulation which is then immediately removed, thus allowing the pressure to fall to something like 140 mm. Hg., there is complete inactivity of the baroreceptors, even though this level would have previously produced a heavy train of impulses. This explains how the baroreceptors adapt to long term rises in blood pressure. There is an entire range of threshold sensitivities to pressure over the individual baroreceptors which at the same time adapt organismically as a whole range to a chronically-held blood pressure. In sustained arousal, this successive and continuous rise of afferent signals results in the organism being unable to maintain a physiological force field stabilized at the lower level over a period of time. Like other "plastic constancy" systems, such as body temperature, there is an upward resetting of the reactivity threshold.

Anokhin (1961) asserts that in order to understand the pathogenesis of sustained high blood pressure, one must hypothesize nervous impulses from the cerebral cortex, which fits well with an emotional origin theory of chronic high blood pressure. He cites work by several Russian physiologists to support his assertion.

The sustained arousal is then mediated by the reticular formation. Much evidence has linked the reticular activating system (RAS) to subserving the attributes of "consciousness," or, more

specifically, of organismic arousal (Magoun, 1950). This "arousal" reaction has been related to the ascending fibers of the RAS leading to the cerebral cortex, and several sensory paths also connect the RAS with the hypothalamus.

Direct stimulation of the RAS produces EEG changes seemingly identical with activating changes observed in EEG's that were taken upon awakening from sleep, and damage to the reticular formation produces a sleeplike state. This makes all the more understandable the ability of chlorpromazine to reduce chronic high blood pressure, since this substance blocks the adrenergic substrate of the RAS, and in this way counteracts the excitatory effects of the cerebral cortex.

Anokhin points out that this "cortico-reticular" system keeps the organism in a state of arousal well beyond the twenty or thirty minutes of time during which the depressor impulses will fire in order to lower the blood pressure. After this time these impulses lose their continuous character on which the inhibitory effect of the vasomotor center depends, and an upward resetting of the stimulus threshold of the baroreceptors occurs, the stage where chronicity of high blood pressure becomes a physiological fact.

Aggression

This paper so far has focused on what will be the dependent variable in this study, i.e., the quantitative measure of blood

pressure. This section will examine the main independent variable, the amount of aggression manifested by each subject. One of the most confusing things in any study which either directly or indirectly involves aggression is the conceptual murkiness associated with the terms "hostility," "anger," and "aggression." More often than not, these concepts are used interchangeably to designate the same phenomenon, or one concept is used to designate qualitatively different phenomena. Kaufmann (1965), as well as others (Buss, 1961), have tried to clarify the usage of these concepts. Extrapolating from these articles, one comes to the conclusion that these are really three separate and distinct constructs.

Hostility, probably the most broadly and often inappropriately used of the three terms, is a motivational construct. It typically is measured through inference or through the introspective report of a reliable subject. Buss (1961) has insisted that one must clearly distinguish hostility, the motivational aspect, from two other factors which are relatively equivalent to hostility. The first is a tendency to view the environment as inimical, a perceptual variable. The second is aggression. A logical conclusion following from the conceptualization of hostility as a motivational construct is that it is more specific and particular than either aggression or anger. It is always transitive to a particular stimulus object.

Anger, while involving psychological aspects, is typically differentiated from hostility and aggression via physiological-anatomical factors. It is a pattern of autonomic arousal serving a preparatory function for subsequent aggression. It does not necessitate aggression, and in fact the facial and postural changes that are components of anger may likewise be inhibited. The facial and postural elements of an anger response can, of course, be observed; but the label "anger" is more reliably applied only after some fairly extensive physiological measures are taken. The general consensus of what an anger state involves physiologically has been adequately described by both Buss (1961) and Kaufmann (1965).

The third construct, "aggression," is a behavioral one. It is measured by observing the acting-out of the organism on the environment. Some theorists do attempt to define aggression in strictly behavioristic terms, as e.g., the number of organism-to-organism contacts (Kaufmann, 1965). However, Feshbach (1964) has insisted on the important point that one must include motivational factors in a conceptualization of aggression. Feshbach's assertion is not surprising since most of his work has been done on the motivational aspects of the phenomenon via the TAT.

By following a strictly behavioristic hypothesis, one begins to define aggression in terms of the other organism's reaction, or in terms of the strength of contact made by one

organism with another, leading to logical absurdities (Kaufmann, 1965). Behavioral acts per se cannot consistently be labeled aggression, unless inferences about motivation or the individual's expectation regarding outcome are made. As the independent variable in this paper, aggression will be used to denote behaviors (Kaufmann, 1965) which are transitive, i.e., are directed against an object. It will denote behaviors where the attacker forcibly removes a person from his goal path and/or imparts obnoxious stimuli to a person. This includes responses where there is a high probability of either of these conditions being achieved were it not for the action being blocked or redirected. This categorization of responses as aggressive is then not defined strictly as behavioral, but rather as a hypothetical construct.

What is the origin of aggression? One theoretical view invokes genetic or hormonal factors to explain aggressive behavior. Beeman (1947) attributed increased aggressive behavior in mice to the administration of male hormones. Konrad Lorenz (1966) is undoubtedly the most influential proponent of the aggression-instinct hypothesis, though his definition of aggression is behavioral and parallels the definition used in this study, in that he considers it as behavior calculated to inflict pain on another or the alteration of conditions in favor of the aggressor. His observations in this

area have been for the most part made on ducks, from which he makes a theoretical leap to parallel explanations in man.

Lorenz' data and his conclusions have both been severely taken to task by Ashley Montagu (1966), the noted anthropologist. He argues that Lorenz in his comment that aggression in man has been "inherited from his anthropoid ancestors" is simply inaccurate. Other such inaccuracies in Lorenz' supporting data are cited by Montagu, but his most vehement critique is reserved for Lorenz' process of inference. He asserts that Lorenz makes a totally unjustified and unsupported leap from a minimal amount of data supporting an aggression-instinct hypothesis in animals to stating that human aggression behavior basically derives from an instinct. In a similar vein, Clark and Birch (1945), as well as Kaufmann (1965), conclude that physiological explanations are of little or no value in accounting for even moderately complex behavior, let alone aggressive behavior. They point out that while hormonal factors may be of some importance in rats and mice, similar hypotheses relevant for animals above this level have not been substantiated.

The other main proposal to explain the origin of aggressive behavior is an environmental one, the frustration-aggression hypothesis (Dollard, Doob, Miller, Mowrer, and Sears, 1939). These authors defined frustration as "that condition which exists when a goal response suffers interference (p. 11)," and aggression

as "an act whose goal response is injury to an organism (p. 11)." The authors hypothesized a one-to-one relationship between frustration and aggression, although this aggression is not always observable, a point often overlooked. There are two basic problems with the original formulation of the frustration-aggression hypothesis.

The first is that while this hypothesis, as originally stated, does contain a "catharsis hypothesis," the latter does not deal substantially with the issue of autonomic arousal. This has resulted in a theoretical short-circuiting of the actual sequence involved. By focusing wholly on the stimulus and response variables, which are indeed important, the organism variables involved have been disregarded. Both the autonomic arousal variables and hostility variables have been largely ignored, the basis for Kaufmann's criticism of the frustration-aggression hypothesis as being circular in definition. The hypothesis, in order to be more accurate, should read the frustration-anger-hostility-aggression hypothesis. This refers to hostile aggression, as opposed to either instrumental or accidental aggression (Feshbach, 1964).

This sequence does not always occur in actuality, and this makes the hypothesis of sustained high blood pressure as a result of the non-expression of aggression an understandable one. When this sequence is frustrated, a higher level of felt or

psychsomatically manifested anxiety can also be expected (Feshbach, 1964; Grown, 1964).

Strictly behavioral interpretations of the frustration-aggression hypothesis have contributed to the lack of knowledge as to which personality factors lead to an interruption or inhibition of the full sequence noted previously. Theorists have hypothesized fear of expressing aggression as the underlying variable in high blood pressure, yet studies involving the experimental arousal of the organism have typically not attempted to be more specific as to what is inhibiting the sequence. Sal Gambaro (1966), in a doctoral dissertation carried out at Michigan State University, has investigated the variables of guilt over the expression of hostility as a major determinant in the inhibition of the expression of aggression subsequent to anger arousal.

Gambaro used the Mosher Incomplete Sentences Test (MIST) (Mosher, 1961) as a measure of guilt over the expression of aggression in his "anger manipulation" experiment. He found that both "low guilt" subjects and "high guilt" subjects showed approximately the same blood pressure increases in the anger manipulation phase. He also found that subjects who were allowed to aggress physically against their frustrator did not show a significant decrease in diastolic pressure. Obviously, this

variable of "aggression-guilt" should at least be considered in any subsequent work on blood pressure levels.

To summarize, the sequence of frustration-anger-hostility-aggression is an ideal sequence of actual occurrences, and can be inhibited at various stages, this inhibition also resulting in such manifestations as anxiety. Kaufmann (1965) cites work stating that anger arousal is not a sufficient condition for aggression, and that one can yet on other occasions make a sound inference to hostility without the actual expression of aggression. However, the hypothesis holds that the sequence would always occur if it were not inhibited or suppressed and in this sense it is a one-to-one response sequence (Kaufmann, 1965; Berkowitz, 1964).

Factors in Essential Hypertension

This paper has presented and hopes to support an aggression-inhibition theory of chronic high blood pressure. Yet many other factors contribute to this development. This section will look at these factors and consider their relevance for this paper. Procedures for controlling same will be in the methodology section. Age, sex, and intelligence level are three variables that immediately come to mind as relevant in virtually any study. There is no strong evidence, however, that intelligence level is an important factor in the development of high blood pressure, except where it is

epiphenomenal to such things as race or age. Miall (1961) concludes there is overwhelming evidence that blood pressure tends to consistently increase with age in the general population, and is one of those variables that must be controlled. McDermott (1960) found a tribe of Navajo Indians in the southwest United States whose blood pressure does not increase with age, yet such a finding is rare.

Miall further notes that, in most studies, consistently replicable results on sex differences have been found. Blood pressure was found to be lower in young women than in young men in all of the populations studied, and higher in old women than old men. Blood pressure rises faster with age in women than in men at all adult age points. The crossover to a higher level of hypertension for women than men appears to occur at the end of the typical reproductive period.

All indications are that race is a factor which should be considered in a study on blood pressure levels. Schroeder (1961), an acknowledged expert in this area, implies that this is not so much because there is clear-cut evidence to support the notion that race is a definite primary factor. Rather, the majority of evidence is extremely confounded by other factors, and no conclusive decision can be made at this point.

The papers presented by both Schroeder (1961) and by Miall (1961) at the Prague Symposium and the round table discussions following same suggest two conclusions. First, findings of high blood pressure levels in various populations probably stem from cultural-emotional factors. Secondly, seldom has anyone clearly delineated which factor is operating.

Schroeder (1961) has also offered a most interesting finding: a consistently significantly negative correlation of the hardness of finished public water supplies with rates of hypertensive heart disease; thus, the "softer" the water, the higher the epidemiological incidence of hypertension. He has presented a most fascinating physiological-anatomical theory as to why this occurs. While fascinating, it ignores the fact that softness of water is usually associated with the degree of civilization of a population, a factor usually positively correlated with the degree of suppression of hostility. This latter line of thinking, as well as directly contradictory evidence to the hypothesis, was offered during the discussion of Schroeder's paper.

Height, weight, diet and smoking are factors that have, on occasion at least, been hypothesized as contributory to the development of high blood pressure. They may at times be correlated with contributing factors such as age or sex, and thus on occasion will appear to be important in themselves. The paper by Schroeder

(1961) and a proceeding discussion of this paper suggest that there is no substantial reason to assume these factors are contributory in even a slight manner. When controlled studies are carried out to investigate the effects of these factors, e.g., as by Damon (1961), no relation to chronic high blood pressure has been found.

The genetic variables must be considered in any study potentially involving physiological factors. The hypothesis of a genetic factor as directly causal to hypertension underlies the theories promulgated by Goldblatt and his colleagues. As mentioned earlier, recent research mirrors a growing general disfavor with this theory. This has tended at the same time to suggest that there is no genetic factor operating.

Yet, to hold the genetic hypothesis in total disfavor because of the inadequacy of Goldblatt's theorizing is to throw out the baby with the bath. Sir George Pickering (1961) has taken a different approach than Goldblatt. He accumulates large statistical samples of hypertensives, normotensives, and their close relatives. He has found higher mean blood pressure values for relatives of hypertensives as opposed to relatives of normals. However, just as in the constant debate over whether there is a genetic factor in schizophrenia or not, this type of approach cannot substantiate a genetic factor in high blood pressure. To interchange

the concepts of "genetic factor" and "family history" is a logical and theoretical error.

The consensus of most modern thinking is that one can at most only hypothesize a possible genetic predisposition to high blood pressure. As mentioned earlier, this could be a "normal" inherited factor such as the strength or size of the artery, which in a large population over a long period of time could play a small part in a quantitative assessment of blood pressure levels.

CHAPTER II

PROBLEM

Prior parts of this paper deal with certain areas and issues that are relevant to a study of aggression and blood pressure. A theory positing emotional rather than physiological factors as primary was presented. The concept of "specificity" was examined since emotion per se is not seen as a causative factor. Rather it is the inhibition of aggression, apparently considered to be basically a suppressive pattern (Feshbach, 1964; Groen, 1964), which leads to either felt and/or psychosomatically manifested anxiety. This anxiety, if it is experienced, should be manifested on a questionnaire measure. Specific emphasis is also placed on the variable of aggression-guilt, i.e., guilt over the expression of aggression. This aggression-guilt was found to be a factor by Gambaro (1966), and an attempt to verify it as a significant factor is an important part of the present study.

Empirical attempts to confirm a hypothesis positing emotional factors as primary have been of two types. First, laboratory studies (Shapiro and Horn, 1955; Oken, 1960; Hokanson,

1961) have been undertaken where varying degrees of rigor have been exerted on the control of contributing variables. They have generally supported the hypothesis. Grinker (1953) and Groen (1964) point out the basic problem with this approach. They note that short-term effects can be clearly demonstrated, yet the crucial factor in the development of a high blood pressure level is the chronicity of the elevated pressure. It is then important to establish the chronicity aspect of the independent variable, in this case the inhibition of aggression. Laboratory studies have not been set up to correlate elevated blood pressure with a chronic pattern of inhibiting aggression, at least not on human subjects.

The other avenue is to study differences shown by various observed and categorized samples by means of an observational-statistical approach. For example, Miasnikow (1961) found two to three times as many cases of essential hypertension among employees of the Moscow Telephone Exchange as in control groups. As in most studies of this nature, there was a control for only age and sex variables.

The naturalistic-statistical study has the advantage of being able to observe the effect of chronicity, but in such studies (Miasnikow, 1961; Hood, 1961), a majority of the relevant variables typically go unconsidered, leaving the "true" correlation an open question. The present study is basically observational-statistical

in method. To definitively assess the chronicity variable in a study of blood pressure in the experimental laboratory would require extensive facilities and time. Another problem occurs if the study uses human Ss, since actual tissue change is an integral part of the theory. As this is a naturalistic study, it has to adequately control all relevant variables to improve on previous studies which have used this approach.

Hypotheses

The basic problem for this study is to investigate the effects of the chronic inhibition of aggression upon blood pressure. First of all, samples of subjects (Ss) are obtained who significantly differ from each other in the amount of aggression expressed in the prison environment.

It is hypothesized that:

1. Ss who expressed interpersonal aggression prior to incarceration and who in the past 18 months while incarcerated have expressed little or no aggression have significantly higher diastolic pressures than those Ss who likewise expressed aggression prior to incarceration, but who have since continued to aggress substantially against the environment.
2. Within the high aggression group of Ss, those who show high guilt over the expression of aggression have

significantly higher diastolic pressures than those who show low guilt over such expression.

3. Ss who expressed interpersonal aggression prior to incarceration and who now suppress or inhibit such expression exhibit more anxiety on an anxiety scale than Ss who prior to incarceration expressed interpersonal aggression and continue to do so after incarceration.

CHAPTER III

METHOD

Subjects

The selection of subjects is most important when, as in the present study, it provides crucial prior control of relevant variables.

The subjects (Ss) were inmates of the State Prison of Southern Michigan (SPSM) at Jackson, Michigan. The original selection procedures were directed at the main record folders of the some 2,000 inmates presently at SPSM. Each file includes every piece of written material produced concerning the individual inmate from the time of his pretrial social history to the present.

The selection procedure focused on the control of these variables:

1. The first was a time variable, more specifically, the length of time spent in the institution from the time of incarceration for the present offense up to the time of selection. Only folders on inmates who have been in prison for at least two years immediately prior to this

selection procedure were retained for further perusal. This eliminated measuring phenomena that were actually reactions to the chaos and threatening situations that the new prison inmate encounters, especially in the first three months of incarceration.

2. Files were retained for further processing only when the inmate had been incarcertated for a crime involving direct physical aggression. This includes murder, manslaughter, felonious assault and also such crimes as rape and armed robbery when perusal of the file indicated that direct aggression was also involved. Ss were thereby comparable on the variable of having expressed aggression immediately prior to incarceration and the differences in subsequent expression within the prison population are rendered more meaningful for this study.

3. While the sex variable was automatically controlled since SPSM is all male, a consideration must be made for age. The age range of 23 to 35 years was employed. Hood, in a discussion of Pickering' s results (Pickering, 1961), states there is only a slight blood pressure rise over time in the age range of 21 to 35 years, relative to later age ranges of similar length, pointing to

the reasonableness of the limits used in this study.

4. Evidence of a direct relationship between race and high blood pressure is at best weak and contradictory (Miall, 1961). Only main files of the few non-Negro, non-Caucasian inmates of the prison were eliminated.

5. For two reasons the files on subjects who are medically-established cases of hypertension were eliminated. The first is so that the small percentage of cases in whom hypertension is of a physiological origin was not involved. Secondly, one avoids studying Ss in whom suppression of affect could be a result of being labeled "hypertensive" (e.g., where advised to "take it easy"). A fortunate mode of control is available in this instance. Less than a year earlier, the Upjohn Drug Company searched the prison for cases of essential hypertension to be employed in a drug study. They gathered all possible clues from the medical records of all patients to obtain as many cases as possible. The list was available and, of course, covered any inmate who had been in the institution for two years.

6. An earlier section of this paper pointed out that obesity has received no substantial support as a primary factor

in chronic high blood pressure (Miall, 1961). However, considering the possibility that it may be contributory in extreme cases, and thus be overlooked in a statistical approach, those men diagnosed as obese or substantially overweight in their medical history file were eliminated.

Diet and the hardness of finished water supplies (Schroeder, 1961) have been suggested as contributing or even primary factors in essential hypertension. These factors, as well as many others along the same line, were controlled by a combination of the homogeneous prison environment and by only using inmates who had been in SPSM for two years or more and who were not medically-established cases of essential hypertension.

The Sample

An original population was delineated by the above procedure. The population obtained consists of males, 23-35 years of age, who are neither mentally defective, overweight, nor medically-established cases of essential hypertension. Each was incarcerated for a crime involving actual physical aggression, had been in prison for at least two years prior to this study, and is either Negro or Caucasian.

A sample of 111 Ss was selected from this population via a table of random numbers. These Ss were assessed for the amount of aggression expressed during the 18 months immediately prior to this study. Thirty-nine Ss, approximately the top one-third of the sample who were lowest on the expression of aggression, were designated the low aggression (Low A) group. This allowed for Ss who might not be tested, and was also a natural break in the variable measured. That is, these 39 Ss were the only 39 not involved in any aggressive incidents, nor did any of these Ss have a report which even suggested an incident of aggression while in prison. The middle group was composed of 33 Ss who had only one definite report of acting-out aggression. The high aggression (High A) group was composed of 39 inmates who definitely acted-out aggressively two or more times. The average number of definite reports for this group was 2.91, and, in addition, this group had been involved in many potentially-aggressive incidents. The range was from two to five definite reports of aggression.

This is a typical officer's report judged as aggressive:

> At 2:10 p.m. today, I observed Inmate X talking loudly to Inmate Y; however, I am pretty sure they didn't see me. As I started to walk up to them, Inmate X jumped at Inmate Y and started hitting him with his fist on his neck and head. Inmate Z helped me pull them apart. As I took Inmate X to the Hall Office, he laughed and said, "I'm glad I hit that black son-of-a-bitch." He didn't resist coming along.

A typical report judged as non-aggressive read:

> At 2:45 this afternoon, I saw a man who I didn't know walking around the kitchen area. I asked his name and what he was doing here. He gave me his name and said he was just walking through. I shook him down and found four pork chops. He would not tell where he got them, and said it was none of my business. I am reporting him for "skating," possession of contraband, and insolence.

All Ss in the high and low aggression groups were then called in for testing, and 35 Ss in each group actually completed the testing. Two of those four Ss in the High A group were not tested because they had recently been transferred to the Marquette Branch (maximum security) of the Michigan Prison System. This furnishes extra validity to the criteria employed, since a transfer to Marquette is used when an inmate has come to be considered so consistently and immediately dangerous to civilians and inmates that he must be placed in virtual isolation. The other two Ss not tested simply refused to participate and would give no reason for this.

Four of the low aggressive Ss were likewise not tested. As in the high group, two men refused to be involved and would give no explanation. Another man had been given a special discharge due to an exemplary record before he could be tested. The fourth was found to be mentally deficient. Also, two completed protocols, one from each aggression group, mysteriously disappeared from the examiner's desk shortly after they had been

completed. Thus, the processing of the results was carried out upon 34 Ss each in both the low and high aggression groups.

The groups were assessed as to possible significant differences on other relevant variables. While several variables have been controlled wholely or partially by the population selection procedures, a check must be made on age, and a check was also made on intelligence. The samples do not differ significantly on any of these three variables. The intelligence scores were on a 1 to 10 unitary scale based on the 16 PF test (Cattell, Saunders, and Stice, 1957). (See Table 1.)

Table 1. -- Basic comparisons of High and Low A groups on mean age, intelligence (Cattell scale), and race.

	Age	Race		16 PF Intelligence Scale
		Negro	White	
High A	28.1	18	16	3.44
Low A	27.8	17	17	3.32

A t-test produced no significant differences between the two groups in age. A Chi-Square yielded like results for race. A Kolmogorov-Smirnov test, for samples less than N = 40 (Siegel, 1956), indicated no significant differences between the high and low aggressive groups in Cattell 16 PF scores (Cattell, Saunders, and Stice, 1957).

Both groups adhere very closely to the distribution of the general prison population with respect to race and intelligence. The prison population is approximately 50% Negro, as in this sample. Approximately 88% of the present sample falls in the low average-average range of intelligence, and the SPSM Reception-Diagnostic Center reports they get closely similar results within the general prison population. Four men in the Low A group and two in the High A group were above average in intelligence, though not one of these men was in the superior range. (See Table 2.)

Table 2. -- Distribution of High and Low A groups on Cattell intelligence scores. (The percentage of general population adults attaining each score is in Table 8.)

Sten Score	1	2	3	4	5	6	7	8	9	10	Total
High A	1	13	2	10	6	0	2	0	0	0	34
Low A	5	8	7	4	6	3	1	0	0	0	34

The literature (Miall, 1961) suggests that over the age range employed in this study (23-35 years), one would only expect an overall average blood pressure rise of 5 mm. Hg. Also, there were no significant differences between the two groups in age. In any case, it appeared worthwhile to investigate whether indeed there was a correlation between blood pressure and age within the two groups. In the High A group, a correlation coefficient of -. 19

was obtained between these two variables. A correlation of +. 35 was the result in the Low A group, a result more in the expected direction. Neither result was close to significance at even the . 10 level of confidence.

In addition to the similarities in the variables mentioned above, there were also no substantial differences in the type of crime involved in the two groups. (See Table 3.) For example, the Low A group had four crimes involving rape and the High A group included five such offenses. Obviously, if there had been a significant difference between the two groups in crimes involving rape, closer scrutiny would be necessary.

Table 3. -- The number of Ss incarcerated for a particular crime (last offense) in both the Low and High Aggression groups.

Crime	High A	Low A
Rape, attempted rape (with assault)	5	3
Murder, first degree	8	11
Murder, second degree	4	3
Manslaughter	4	1
Robbery, armed, with assault	7	10
Assault to murder, felonious assault	6	5
Sodomy, with assault	0	1
TOTAL	34	34

A post hoc decision was made to see whether there was a significant difference between groups in the amount of consecutive time (in months) spent in the institution prior to being included in this study. Due to transfers and discharges, data was available on only 29 Ss in each group, out of the original 34 Ss tested. The mean number of months was 36.1 in the High A group, and the range was from 24 to 60 months. In the Low A group, the mean was 35.2 months, and the range was from 24 to 65 months. The t-test on this data was not even close to being significant, and the F-test indicated homogeneous variances. A conclusion that these two groups are quite similar on all relevant variables appears to have strong justification.

Measurements

1. Blood pressure was measured by means of a sphygmomanometer, the most common measure employed. Gambaro (1966) described the procedure as follows:

> This method of measuring blood pressure is called the auscultatory technique because the examiner employs a listening device, a stethoscope, in order to take his measurements. To take a blood pressure reading, the examiner encircles the subject's upper arm (usually his left arm) with a rubber tube that can be inflated with air. The amount of air pressure in the cuff is measured by a column of mercury (Hg.). Hence, blood pressure readings are usually stated in millimeters (mm.) of mercury. The examiner inflates the cuff so as to completely stop the flow in the main, or brachial, artery of the arm. He then releases pressure in the cuff until he

> can hear a beating sound through the stethoscope, which is applied to the artery below the cuff. The height of the mercury column at the time when he first hears the sound is the systolic blood pressure. The examiner then releases more air from the cuff until he can no longer hear the beating sound. The height of the mercury at that somewhat indetermined time when the beating sound can no longer be heard is the diastolic blood pressure. (p. 27)

2. Aggression-Guilt was measured by means of the Mosher Incomplete Sentence Test (MIST), or, more specifically, by the fifteen sentence stems that refer to aggression-guilt. Ten extra MIST items were also administered so as to cushion a blatant "aggression" pull in the scale. The test is actually a fifty item sentence completion sheet devised and then validated by Mosher (1961) as a measure of three types of guilt: aggression-guilt, sex-guilt, and morality-conscious guilt. His method for scoring the sentence completions used referents for guilt largely derived from psychoanalytic theory. The MIST allegedly measures relatively suppressed feelings of self-criticism for failure to live up to the person's internalized ideals.

The reliability between judges in the categorization of responses on the aggression-guilt continuum of the MIST has been established in two previous studies (Mosher, 1961; Gambaro, 1966). Mosher obtained an inter-rater reliability of .90, while Gambaro reported a reliability of .86. The same instructions, etc., were used in this study as in the two previous ones, with

one difference. One MIST aggression-guilt stem was typed "I have . . ." rather than "I hate . . .;" and since this was not noticed until the completion of the study, only 14 responses were available on each subject for rating.

Construction of the MIST

The stems for the sentence completion test were collected by Mosher from three psychologists, and were derived mainly from ideas drawn from psychoanalytic theory. The two hundred stems collected were divided into parallel forms and administered to 38 VA Hospital patients. Stems were rated on degree of information elicited, and those selected were rated into the three aforementioned guilt classes. The final form then consisted of fifty of these agreed-upon items.

In his dissertation, Mosher (1961) predicted that subjects high on hostile-guilt, as determined by his test, would not condition as easily to hostile content as Ss scoring low on hostile-guilt. This hypothesis, reflecting the degree of construct validity, was substantiated. As was mentioned earlier, Gambaro (1966) found guilt over aggression, as measured by the MIST, to be a contributing factor in the subject's reaction to his experimental manipulation. Mosher's and Gambaro's use of median cutoff points for dichotomizing into high and low guilt groups was employed in this study also.

The Cattell 16 PF Test

The Cattell 16 Personality Factor Test is a questionnaire containing 187 items. Cattell, Saunders, and Stice (1957) assert that measurements on 16 unitary personality factors are obtained by this test, and that each of the 16 factors corresponds to a primary personality factor established outside the questionnaire realm, such as in ratings of real life behavioral situations or in social response patterns. Split half consistency coefficients on each of the 16 factors range from 0.71 to 0.93.

There are three forms of this test, which are considered to be equivalent when expressed in standard or sten scores. Form A was employed in this study. The sten scores are obtained by referring to norms that the authors have gathered on various populations such as male and female college students, or on males or females in the general population, etc. Three alternative answers to each test item are provided for, since the authors feel a "two-choice" item frustrates genuine attempts to give accurate answers and can produce a general disinclination to respond to the test.

After the items were first screened for factor validity, and for a good distribution of their alternative responses, they were chosen so that on each factor just as many positive or negative responses contributed to the total score, thereby avoiding

score distortion through mental sets. Also, the items have been arranged so that responses for one factor do not bunch together.

Procedure

The selected Ss were classified on the aggression variable, using the files of the Deputy Warden of SPSM. The Deputy's office keeps an extensive file on every acting-out incident in which any inmate is involved. An occurrence is reported and filed, whether it is punished in some way or not; whether it involved inmates alone, or both custody personnel and inmates; and also if it was the threat of aggression that did not get beyond the verbal stage. Ss were ranked by the number of incidents that involved acting-out aggression, or where this was apparently prevented only by the interference of custody officers.

A reliability check had to be carried out on the placing of officer's reports from the Deputy's files into aggressive and non-aggressive categories. Ten reports were randomly selected from those previously seen as aggressive by the investigator. Ten reports that had been seen as non-aggressive were also randomly selected. These twenty reports were presented to a psychiatric social worker, who is employed by the Psychiatric Clinic. He was told to simply judge whether the report involved direct physical aggression or not. He was presented with a pile of approximately 50 slips of paper, the top 20 of which were the retyped

reports, the last 30 being only blank sheets of paper. This alleviated the problem of biasing his last several responses from a potential attempt to even up the response piles, etc. There was agreement between the two judges (investigator and social worker) on 19 of the 20 incidents. One of the reports categorized as aggressive by the primary judge was seen as non-aggressive by the second judge. Using a 2 by 2 table, a Chi-Square of 16.36 was obtained, high enough to reject a null hypothesis of no relationship between judges at the .001 level of confidence. The contingency coefficient of correlation on this data was .67, quite high since, as Siegel (1956) asserts, the upper limit of this correlation coefficient for a 2 by 2 table is .707.

A short letter was written to the selected inmates, requesting them to come to the Psychiatric Clinic when they receive a call. The letter covered these points:

1. It emphasized that the particular inmate contacted had been randomly selected from the general population.

2. Each inmate would receive two packs of cigarettes for participation in a research project, and the time required would be from thirty to fifty minutes. (Two packs of cigarettes is equivalent in cost to the highest pay a prisoner can receive for an eight hour job in SPSM. The typical pay is only 35 to 40 cents a day for an inmate's work.)

3. The study was in no way connected with the Psychiatric Clinic, except that the person running the study works in the clinic. The affiliation with Michigan State University was noted.

4. For each person who participated, a letter will be placed in his record file stating only that he very generously and cooperatively participated in research conducted by one of the Psychiatric Clinic Staff. The high value of such a commendation is well known to each inmate for its relevance in parole processing.

5. Anonymity will be retained and all information will be available only to the investigator and his assistant. Information as to the outcome of the study, etc., will be available to all participants, upon request, at the end of the study. They will be notified when this is available.

These Ss were put on call to appear in the Psychiatric Clinic at a specified time. If a man did not show up, a letter was written indicating that he had been put on call for a specific time. (At times, calls are simply not relayed by the civilian clerks.) This second letter re-emphasized the points made in the first letter, stated what time the S would be placed on call for, and stated that if he did not receive this call he should call himself or send a note to the experimenter in the Psychiatric Clinic and he would be called up immediately, a common procedure. When he reported to the clinic, the following occurred:

1. He was escorted to an office by E.[1] A conversation of approximately five minutes was held to allay any anxieties or answer any questions S might have and simply make him more comfortable in the situation.

2. E then showed S the sphygmomanometer, explained what it is, took a blood pressure reading, and then recorded it.

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[1] E, the prison psychology clerk, carried out the procedure under the direct supervision of the author.

3. Following this reading, he told S to relax, and that he (E) would return in a few minutes or so.

4. In ten minutes E did return and took a second blood pressure reading, then waited exactly 15 seconds, and took a third reading.

5. Immediately after taking the third reading, E gave S a pencil and a copy of the MIST, telling him to answer the items as honestly as possible and that his answers would remain anonymous and confidential. He was told to let E, who read a book at the other end of the office, know when he finished.

6. At that point E gave S Form A of the Cattell 16 PF Test, with the appropriate test instructions, and also repeated the instructions in step five.

7. At the completion of the test, S was thanked and asked not to divulge to anyone what went on in the experiment until notified by mail that the entire test was completed.

An average of the second and third blood pressure readings (step 4) was used as the index of the inmate's blood pressure level. Previous to the running of Ss, blood pressure readings were taken on ten randomly selected inmates by both the psychology clerk (E) and Mr. Alfred Wigley, an R.N. with twenty years of experience. (See Table 4.) The complete procedure of putting the cuff on, etc., was carried out by both examiners. A Pearson product-moment correlation of .97 was attained on the diastolic pressure readings, the focal variable in this study. (A correlation of .67 was attained on the more unstable systolic pressures.)

Each single response to the MIST was retyped on a single slip of paper, coded, and presented for judging to a psychology

graduate student.[1] The responses were rated on a one to five scale for the degree of guilt over the expression of aggression. Ss total scores were tallied, and Ss were then ranked in order of indicated guilt (Mosher, 1961).

Table 4. -- Systolic (upper number) and diastolic (lower number) pressures for 10 Ss, to establish E's reliability in taking blood pressures.

Examiner	1	2	3	4	5	6	7	8	9	10
E	124/66	130/70	124/88	132/78	122/62	126/70	116/60	130/70	130/80	118/70
R. N.	126/68	130/70	120/86	136/80	120/66	126/76	114/60	126/72	126/78	120/70

Two hundred responses were drawn from these responses, using a table of random numbers, and presented to the investigator for judging. An inter-rater reliability coefficient of .86 was obtained, comparable to the .90 and .86 obtained by Mosher (1961) and Gambaro (1966) respectively. Responses from this sample can apparently be reliably scored. The anxiety factor on the Cattell 16 PF was scored as directed in the Cattell Manual (Cattell, Saunders, and Stice, 1957), a combination of six of the sub-scales in that test.

Treatment of the Data

T-tests may be employed to test the significance of all three hypotheses. The sten scores of the 16 PF test are reported

by the Cattell Manual (Cattell, Saunders, and Stice, 1957) to be equal-interval scales. Also, the variables are essentially normally distributed, using sten scales, in either a college or general population. The general population sten norms were used in this study. (T-tests and non-parametrics have been employed to assess whether the groups differed significantly from each other on such variables as race, intelligence, etc.)

CHAPTER IV

RESULTS

Primary Hypotheses

After the reliabilities of the various measurements had been established, and the two samples were found to be derived from the same population pool, the results relevant to the hypotheses were then examined.

Hypothesis I

The first hypothesis states:

> Ss who expressed interpersonal aggression prior to incarceration and who in the past 18 months while incarcerated have expressed little or no aggression have significantly higher diastolic pressures than those Ss who likewise expressed aggression prior to incarceration but who have since continued to aggress substantially against the environment.

Table 5. -- Mean blood pressures (using the average of the Ss' s second and third readings as the item score) for the High and Low A groups.

	High A Mean	Low A Mean	"t"	d.f.	P	Direction
Systolic	116.2	120.9	1.39	66		2-tailed
Diastolic	71.1	76.8	2.43	66	.01	1-tailed

A t-test on the diastolic blood pressures between the High and Low A groups yielded a "t" of 2.43. With 66 d.f., and the 1-tailed confidence limit decided upon earlier, the null hypothesis was rejected at the .01 level of confidence. Thus, the hypothesis may be accepted that within the group of men who were incarcerated for aggression, those who continued to aggress while institutionalized have significantly lower diastolic blood pressures than those men who ceased to aggress physically while institutionalized. Using the systolic pressure, a significant result was not obtained, though it was in the same direction as found using diastolic pressures.

Hypothesis II

The second hypothesis states:

> Within the high aggression group of Ss, those who show high guilt over the expression of aggression have significantly higher diastolic pressures than those who show low guilt over such expression.

Table 6. -- Mean blood pressures for the high and low guilt groups within the High Aggression group.

	High Guilt Mean	Low Guilt Mean	"t"	d.f.	P	Direction
Systolic	120.2	112.7	1.77	32		2-tailed
Diastolic	75.0	67.35	2.41	32	.025	1-tailed

Measures of such guilt were compounded from the MIST ratings as described earlier and the High A group dichotomized at the median MIST score, as per Mosher (1961) and Gambaro (1966), into high and low guilt groups. A t-test on the blood pressure indices between these two groups resulted in a "t" of 3.17. Using a two-tailed test with 32 d.f., the result is significant at the .05 level of confidence. Thus, the null hypothesis is rejected. Within those inmates who continued to aggress substantially after incarceration, those with higher guilt over the expression of this aggression showed significantly higher diastolic blood pressures. Using systolic pressure measures, the result was not significant, yet is again in the same direction as obtained using diastolic pressures.

Hypothesis III

The third main hypothesis reads:

> Ss who expressed interpersonal aggression prior to incarceration and who now suppress or inhibit such expression exhibit more anxiety on an anxiety scale than Ss who prior to incarceration expressed interpersonal aggression and continued to do so after incarceration.

Table 7.-- Mean anxiety scores (derived according to Cattell, Saunders, and Stice, 1957) for the High and Low Aggression groups.

	High A Mean	Low A Mean	"t"	d.f.	P	Direction
Cattell Anxiety Score	7.82	7.62	.449	66		2-tailed

Anxiety scores were derived from the Cattell 16 PF protocols, as described earlier. A t-test on these anxiety scores between the High and Low A groups yielded a "t" of .449. The result was not close to significant; therefore, the null hypothesis was accepted.

Additional Findings

While not proposed earlier, there is an apparent corollary hypothesis to Hypothesis II. That is, those Ss in the Low A group should have significantly lower guilt scores as measured by the MIST than the High A group. A t-test on the guilt scores between the High and the Low A groups resulted in a "t" of 1.68. This was extremely close to significance at the .10 level of confidence using a two-tailed test and 66 d.f. However, an F-test between the variances of the Low A (S = 22.4) group and the High A (S = 45.9) was significant, indicating heterogeneous variances. Using one-half the degrees of freedom to compensate for this heterogeneity, the "t" did not come close to significance. The trend, however, was in the expected direction.

From the results on Hypothesis II, pointing to the importance of a guilt factor in the development of high blood pressure within the High A group, the question arises whether this guilt factor operates throughout the sample. A product-moment

correlation was run between the blood pressure indices and the MIST guilt scores over the whole group. A positive correlation of .106 was obtained, a trend in the expected direction, though certainly not statistically significant.

Each of the Cattell 16 PF factors was graphed to show the distribution of scores within both the High and Low A groups, as well as the overall distribution. The Cattell sten scores were designated as the ordinate variable and the blood pressures were ordered along the abscissa. Only the data on Factors A and F indicated the possibility of a significant difference between groups. A high score on factor F, according to the Cattell Manual, indicates a happy-go-lucky personality, whereas a low score reflects a sober, prudent, and serious individual. This experimenter's first hypothesis would have been that the High A group would score higher on this factor, yet the Low A group was higher. The results on both factors, however, were not significant, using t-tests.

Other than this, the scores of the two groups are remarkably similar. Two explanations are feasible in this regard. First, the similar Cattell scores could be construed as supporting earlier assertions that these samples are truly comparable and from the same population pool. Otherwise, it suggests that the Cattell 16 PF is not powerful enough to differentiate these two groups that do indeed exhibit different behavior. The means of

the Cattell sten scores of both groups, as well as the overall mean, are presented in Table 8, along with a description of each 16 PF factor and the percentage of the general population adults usually attaining each score.

Taking the sample as a whole, the overall mean deviated two and one-half or more sten scores from the general population mean on factors B, C, M, and O. (See Table 8.) This indicates that the sample mean of these factors occurred at a point beyond which only 24% of the general adult population would fall. One could speculate from this that the present sample tends to be less emotionally stable (C), less intelligent (B), more imaginative or bohemian rather than conventional (M), more suspicious (L), and more apprehensive than placid or serene (O), when compared to the general population.

The literature suggests possible correlations between blood pressure levels and Cattell 16 PF factors. Cattell and Scheier (1959) claim to have found positive correlations between high systolic blood pressure and factors A+ (extroversion), Q_2- (group dependency), N+ (shrewdness), M- (practicality), and E+ (assertiveness), yet no further description of subjects, procedures, or results was provided. Harburg, Julius, McLeod, McGinn, and Hoobler (McGinn, et al., 1964), however, find a correlation of high systolic pressure

Table 8. -- Cattell factor descriptions, Low and High A group and overall group mean sten scores, and the percentage of general population adults attaining each sten score.

Factor	Low Sten Score Description	High Sten Score Description	Low A	High A	Overall Mean
A	Reserved, detached	Outgoing, warm	6.35	7.20	6.77
B	Less intelligent	More abstract	3.32	3.44	3.38
C	Easily upset	Emotionally stable	2.71	2.94	2.82
E	Humble, mild	Assertive	4.41	4.85	4.63
F	Sober, serious	Happy-go-lucky	4.55	3.91	4.22
G	Expedient	Conscientious	3.94	3.97	3.96
H	Shy, timid	Socially bold	5.23	4.67	4.95
I	Tough-minded	Sensitive	6.67	7.23	6.95
L	Trusting	Suspicious	7.17	7.58	7.37
M	Conventional	Imaginative	7.91	7.17	7.54
N	Forthright	Sentimental	5.08	5.20	5.14
O	Placid, serene	Apprehensive	7.61	7.88	7.74
Q_1	Traditional	Experimenting	5.52	5.41	5.46
Q_2	Group-dependent	Self-sufficient	6.23	6.35	6.29
Q_3	Follows own urges	Controlled	6.05	5.82	5.93
Q_4	Relaxed, torpid	Tense	7.29	7.17	7.23

A sten of	1	2	3	4	5	6	7	8	9	10	is obtained
by about	2.3	4.4	9.2	15.0	19.1	19.1	15.0	9.2	4.4	2.3%	of adults.

with the minus end of the E scale (submissiveness), and also with the I+ scale (sensitivity).

Using the overall group of 68 Ss, correlations were run between the average of the last two systolic measures on each S and the factors cited above. The results are presented below in Table 9. No significant correlation was found between high systolic blood pressure and any of the Cattell 16 PF factors suggested above.

Table 9. -- Correlations of systolic blood pressure indices with Cattell factor scores, using the overall sample. (See Table 8 for Cattell factor descriptions.)

	Factors					
	A	E	I	M	N	Q_2
Correlation Coefficients	+.068	+.095	+.058	-.056	-.125	-.030

While the groups did not differ significantly in race, it was decided to find out whether Negroes and whites in the overall group differed significantly in blood pressure, using the diastolic pressure indices. The mean blood pressure for the 35 Negro Ss from the overall group was 74.8, and the mean for the 33 whites was 73.0. A "t" of 1.03 was obtained, and using degrees of freedom and a two-tailed test, the result would not be significant at better than the .30 level of significance. Nevertheless, the trend

for Negroes to exhibit higher diastolic blood pressures is in line with the majority of evidence (Miall, 1961).

At one point, there was a question whether the assessment of differences between groups regarding changes in blood pressure from the first to the second reading might yield interesting data, especially in regard to systolic pressure, since it is significantly more responsive to short-term attitudinal changes. However, it became apparent, partially in retrospect, that results would be highly contaminated by several factors. For example, several Ss had a chance to sit and rest 15 minutes or more prior to being met by E and escorted to an office, while others were seen immediately, often after a long walk to the clinic. This would certainly affect the systolic pressure results, especially on the first administration of same, and there was no control for this or other like variables. An inspection of the relevant data indicates that indeed there were no significant differences in the scores between groups anyway.

CHAPTER V

DISCUSSION

The main hypotheses of this study were apparently substantiated. Yet, before these could be meaningfully examined, several other aspects had to be established. Most importantly, the measuring instruments used have to be reliable. The use of a sphygmomanometer for recording blood pressure was obviously appropriate, and in a reliability study between the examiner and an experienced registered nurse, reliability was established for this procedure. Mosher (1961) thoroughly established the reliability and validity of the MIST, and the reliability of aggression-guilt items was further supported by Gambaro (1966). Constant re-evaluations for both reliability and validity have established the Cattell 16 PF test as a solid questionnaire instrument for research purposes.

The categorization of incident reports as aggressive or non-aggressive was supported as reliable. A second judge similarly assessed 19 of the 20 decisions made by the investigator, enough to reject the null hypothesis of no relationship at the .001 level of confidence.

The validity of the samples used must also be ascertained. The results strongly suggested that the samples were indeed random samples of a larger population pool, and did not differ from each other, exclusive of the hypothesized variables. The samples were similar in such potentially within-sample differentiating variables as age, race, and intelligence. The high similarity in intelligence scores, the limited range of intelligence scores, and the fact that no more than approximately 10% of the Ss have a high school diploma or more suggests the samples are homogeneous socio-economically. Important also in the establishment of sample validity were the low and non-significant correlations of blood pressure and age within each sample. The high similarity of both the High and the Low A groups on the Cattell Scales, as shown in Table 8, likewise tends to support the assertion that these samples were comparable and from the same population pool.

The primary hypotheses (I and II) were strongly supported, at the .01 and the .025 levels of confidence respectively. This adds depth to the research and theorizing cited earlier by providing an "in vivo" study on chronicity in humans. These results dovetail nicely with those studies carried out by Gambaro (1966), Hokanson, et al. (1961; 1962, a, b; 1963), and others.

Those authors solidly documented an immediate rise of blood pressure upon the presentation of aggression-eliciting

stimuli. Calhoun (1962) has demonstrated that a long-term condition of such stimuli may induce hypertensive-like states in rats. Groen (1964) reports the non-expression of aggression in those diagnosed as "essential hypertension" cases. Though this paper does not focus on hypertension cases, one could logically expect that in human Ss, a long-term condition of not expressing felt aggression would result in a state of chronically higher blood pressure than in those Ss who did express aggression in a similar environment. This was the object of the first hypothesis, and was so supported.

The second hypothesis focuses on the personality factors related to high blood pressure. Little previous work has been done in this area to indicate whether the factor involved might be anxiety over fear of retaliation, guilt, or what. Gambaro's (1966) paper, focusing on short-term effects, would suggest guilt over the expression of aggression as the relevant factor. This was supported and amplified in the present study as pertinent to chronic effects.

No significant results were found when systolic pressure indices were substituted for diastolic indices in the first and second hypotheses, though results were in the same direction. Actually, this experimenter did not expect significant results using systolic pressure since, first of all, it is a very unstable physiological measure. Some evidence of this was noted in the inability

of the psychology clerk and registered nurse to get highly reliable systolic blood pressure measures, whereas they did obtain such results on the diastolic measures. Wilson (1961) cites another reason why significant results with systolic pressures should not be expected. He asserts that the establishment of persistent high diastolic pressure is a prelude to a consistent and stable rise in the systolic blood pressure, and is substantially prior to the development of pressures high enough to be considered essential hypertension. It is in this latter condition that the systolic pressures also remain consistently high.

The non-significant results obtained in regard to Hypothesis III indicates that anxiety, as measured by the Cattell, is not related to chronic high blood pressure. Two research trends offer a rationale as to why this is not so. Groen (1964) has most clearly stated the first point. He notes that in persons who incur a psychosomatic disorder, there is little or no consciously-expressed anxiety. In fact, he argues that anxiety, if it is present, is totally repressed rather than suppressed. Much of what is tapped by the Cattell Scales is consciously-expressed anxiety, or at most, anxiety which is only thinly-disguised and suppressed.

From a different viewpoint, the absence of an anxiety state accompanying the aggression-high blood pressure syndrome could be inferred. The experiments of Ax (1953) and Schachter

(1957), noted earlier, did not consistently find a long-term diastolic blood pressure rise accompanying anxiety. Yet, the first reason given, the denial of anxiety by psychosomatic-prone individuals, has the most immediate relevance for this study considering the measuring instrument used. A strictly physiological measure of anxiety might have produced different results, but many would then argue that a strictly physiological measure could not properly be termed "anxiety."

A strict generalization from the results of this study can be made only to the population from which the Ss are drawn. This would then limit the results to SPSM inmates who were incarcerated for a crime involving physical aggression. Yet, there is no reason to suppose that the general finding is not valid throughout the general population. Further discussion will be in light of the probable relevance of these results to the general population.

The crucial role that guilt over the expression of aggression plays in the development of chronic blood pressure is quite consonant with the hypothesizing referred to in the theoretical section of this paper. Anokhin (1961) is most typical and lucid in elaborating this viewpoint. The crux of his theory involves the cortically-generated inhibition which upsets the autonomic-sympathic balance, especially in regard to blood pressure. This cortical inhibition, mediated by the reticular activating system, keeps the

organism in a state of arousal well beyond the approximately twenty-five minutes of time during which depressor impulses will fire.

Guilt, since it is closer to a strictly cognitive construct, fits better with Anokhin's standpoint than with such emotion-oriented constructs as "fear" or "anxiety." These latter constructs could fit comfortably with a physiological theory of chronic high blood pressure that refers exclusively to lower brain functions. However, the cognitive aspects of the guilt construct demand a theory which considers the role of the cerebral cortex, i.e., the type of theory supported by the present data.

The findings of this paper are also more pertinent to Anokhin's physiological data than a theory positing only stress per se as the decisive factor. Stress alone could be fitted more parsimoniously with a theory referring only to lower and mid-brain structures. However, where guilt is involved, even under the aegis of the strictest parsimony, reference to cortical processes is necessitated.

Another assertion is quite clearly implied in the previous statements. That is, these results support an emotion-origin based theory of chronic high blood pressure or "essential hypertension" over any variant of the physiological disease approach such as Harry Goldblatt's renal-humoral theory, considered earlier in this paper (Cottrell, 1961).

In this study, Negro Ss manifested a higher mean diastolic pressure index (74.8) than white Ss (73.0). This difference was not significant and therefore offers little substantial support for the majority of research which suggests Negroes have higher blood pressures than whites (Miall, 1961), though it certainly does not contradict this research.

The research literature (Cattell and Scheier, 1959; McGinn, et al., 1964) also suggested that several Cattell scales (A+, Q-, I+, N+, M-, and E+ or -; see Table 8) might be correlated with high systolic blood pressure. For the overall sample employed in the present study, not one of these scales was found to have anything near a significant correlation with high systolic pressure. Neither were the High and Low A groups found to differ significantly from each other on any of the Cattell scales, even when the two groups differed from the general population mean. Apparently in this study the Cattell 16 PF was more responsive to the gross variables of age, sex, and intelligence than to those variables related to the differing behaviors manifested by these two groups.

The primary hypotheses of this paper were strongly and clearly supported. However, in order to substantiate any generalizations made to the general population, further studies are going to be needed. One interesting feature should be examined

in these further studies. That is, it would appear very relevant to determine what types of personality factors allow one group of people to act-out aggressively in spite of guilt, whereas another group is inhibited from such action, apparently as a result of this guilt.

CHAPTER VI

SUMMARY

Research on high blood pressure and theories as to how "essential hypertension" develops have suggested that the suppression of aggression may be a primary agent contributing to these disorders. Such people as Groen (1964), Saul (Alexander and French, 1948), and Hokanson and his colleagues (1961; 1962, a, b; 1963) have all, in one way or another, supported this hypothesis. Gambaro (1966) has indicated that guilt over the expression of aggression is a vital factor in this regard. If guilt is a factor, a supporting physiological theory must take account of cortically-generated inhibition. Anokhin's (Cort, et al., 1961) theorizing on the genesis of chronic high blood pressure, which was presented in this paper, takes account of such factors.

A population of SPSM inmates was selected on the basis of several criteria. First, only inmates were used where the offense resulting in incarceration had involved direct physical aggression. They were also selected on such relevant factors as age, weight, race, and prior medical history. These inmates were categorized

into Low and High Aggression groups, depending upon their behavior pattern since being institutionalized.

Sixty-eight Ss (thirty-four in each group) were processed. After taking a preliminary blood pressure, two blood pressure measures were taken fifteen seconds apart, and the MIST (Mosher, 1961) was administered to assess the amount of guilt over aggression. The Cattell 16 PF test was administered in order primarily to obtain both an anxiety and intelligence score.

An average of the last two blood pressures taken on each subject was used, in order to increase the validity of the measure. The MIST responses were rated for aggression-guilt. The reliability on rating the MIST has been established by Mosher (1961), Gambaro (1966), and by the investigator and an independent judge in the present study. Anxiety and intelligence scores were assessed per instructions in the Cattell 16 PF Manual.

The results led to the following conclusions:

1. A continued state of the non-expression of aggression in those men who have at one time expressed direct physical aggression results in chronically higher levels of diastolic blood pressure than in those men who continue to aggress against the environment.

2. Within that group of men who continue to aggress against the environment, those who have guilt over such expression develop chronically higher blood pressure than those who do not have such guilt.

3. Self-reported anxiety is not related to the raising or lowering of diastolic blood pressure levels, or to the expression of aggression.

Several suggestions for future research were presented.

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APPENDIX A

These are the 25 MIST items employed in this study, taken from the original 50 items used by Mosher. Those items with the number underlined were those rated in order to obtain the aggression-guilt score.

1. When I tell a lie . . . .

2. The idea of murder is . . . .

3. When someone swears at me . . . .

4. Most women who curse . . . .

5. After a childhood fight, I felt . . . .

6. My father . . . .

7. After an argument . . . .

8. When I have sexual dreams . . . .

9. To kill in a war . . . .

10. Arguments leave me feeling . . . .

11. Most women . . . .

12. If I robbed a bank . . . .

13. When anger builds inside me . . . .

14. A mother . . . .

15. If I felt like murdering someone . . . .

16. I have . . . .

17. I should have been punished for . . . .

18. After an outburst of anger . . . .

19. One should not . . . .

20. When I was younger, fighting . . . .

21. A guilty conscience . . . .

22. Capital punishment . . . .

23. If I hated my parents . . . .

24. If I committed a homosexual act . . . .

25. If I killed someone in self-defense . . . .