SOCIAL COMPETENCE AS A MEDIATING VARIABLE IN ESSENTIAL HYPERTENSION

BY

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Summary

The personality literature and experimental findings regarding the interaction of stress and cardiovascular responses suggest that hypertensives display a distinctive cognitive, behavioral and psychophysiological reaction pattern to stressful interpersonal situations; i.e., less socially competent and more aroused. The present research was an effort to provide empirical support for such a pattern.

Subjects were adult males with normal blood pressures (BP < 140/90 mm hg), untreated hypertensives and hypertensives on antihypertensive medication. Anxiety, cognitive measures of self-perception, and situational stress evaluations were conducted prior to a stress induction. Blood pressure and heart-rate were monitored while subjects interacted with trained role-players in two types of role-play situations (individually relevant high distress and low distress conditions). Role-play behavior, perceived distress and degree of reality were evaluated to control for stimulus equivalence and distress specificity.

Against prediction hypertensives did not report greater anxiety nor were they evaluated as less behaviorally skilled. The cognitive reaction pattern, however, discriminated between the groups with hypertensives perceiving less stress and displaying a "repressive-defensive" style. Treated and untreated hypertensives displayed a specific hyperresponsivity on systolic blood pressure which was not evident on heart-rate. With regard to diastolic blood pressure, controls and treated hypertensives

reacted according to prediction with the high distress situations resulting in greater elevations in pressure than low distress situations. Untreated hypertensives showed the reverse of this pattern with less of an increase in diastolic pressure during the high distress situations.

The potential interaction of a repressive cognitive response style and blood pressure responses is discussed. The implications of these findings for research on hypertension and stress and for biobehavioral treatments are highlighted.

Résumé

La littérature sur la personnalité ainsi que des données empiriques sur l'interaction du stress et de la réaction cardiovasculaire indiquent que des manifestations hypertensives en tant que réponses cognitives, comportementales et psychophysiologiques bien distingués, sont plus souvent provoquées devant une situation interpersonelle stressante (i.e., moins d'habilité sociale et anxiété élevée). La présente étude, désire donc apporter un support empirique à un tel modèle.

Les sujets étaient tous des adultes mâles, certains avaient une tension arterielle normale (< 140/90 mm Hg), d'autres étaient des hypertendus sans traitement et finalement quelques uns étaient des hypertendus avec médication antihypertensive. Des mesures sur l'anxiété, sur l'auto-perception et ainsi que l'évaluation de situations stressantes avaient été recueillies dans la première phase de l'experimentation. La deuxième phase consistait en une série d'interactions entre assistants de recherche et sujets au moyen de jeu de rôle, ceux-ci avaient deux variations (i.e., des situations pertinentes pour les individus avec peu où beaucoup de stress). Notons que la pression artérielle et les pulsations cardiaques ont été enregistrées tout au long de ces interactions. Les comportements des assistants de recherche en situation de jeu de rôle, la perception du stress subjectif et le degré de perception de la réalité, ont été evalués pour contrôler l'équivalence des stimuli et l'intensité du stress.

Contrairement aux prédictions, les sujets hypertendus n'ont pas indiqué un niveau d'anxiété élevée et n'ont pas été evalué comme possédant moins d'habiletés sociales. Cependant les réponses cognitives ont indiqué que le groupe des hypertendus percevait moins le stress et montrait davantage un style répressif et défensif. Les hypertendus avec et sans médication ont indiqué une hyperréactivité spécifique à la pression artérielle systolique; hyperréactivité qui n'apparaissait pas au niveau des pulsations cardiaques. En ce qui concerne la pression artérielle diastolique, les sujets contrôles et ainsi que les hypertendus avec médication ont réagis selon les prédictions, c'est à dire avec une augmentation plus significative devant une situation de très grand stress que devant une situation de peu de stress. Par ailleurs, les hypertendus sans médication ont indiqué le contraire: avec aucun augmentation de la pression diastolique en situation de grand stress.

Conséquemment, la discussion des résultats s'oriente sur l'interaction potentielle d'un modèle de réponse cognitive de type repressif et ainsi que sur la réactivité de la pression artérielle. Les implications de ces résultats pour la recherche de l'interaction du stress et de la pression arterielle et ainsi que pour le traitement pharmacologique de l'hypertension sont aussi discutés.

Zusammenfassung

Literatur zur Persoenlichkeitsforschung und experimentelle Befunde zur Interaktion von Stress und kardiovaskulaerer Reaktivitaet deuten an, dass Hypertoniker charakterisiert sind durch eine spezifische kognitive, Verhaltens- und psychphysiologische Reaktion in zwischenmenschlichen Stress-Situationen(d.h., erhoehte Angst und Mangel an sozialer Geschicklichkeit). Die vorliegende Studie stellt einen Versuch dar, dieses Verhaltensmodell empirisch abzusichern.

Versuchspersonen waren erwachsene Maenner mit normalem Blutdruck (< 140/90 mm Hg), unbehandelte Hypertoniker, und Hypertoniker, die blutdrucksenkende Medikamente nahmen. Messungen zur Angst, Selbstwahrnehmung und situationsabhaengiger Stresswahrnehmung wurden durchgefuehrt im ersten Teil der Studie. Im zweiten Teil interagierten die Versuchspersonen mit trainierten Rollenspielern in zwei verschiedenen Niveaus des Rollenspiels (d.h., individuell relevante, niedrige oder hohe Stressbelastung); Blutdruck und Herzschlag waehrend des Tests wurden kontinuierlich gemessen.Rollenspieler-Verhalten, wahrgenommener Stress und subjektiv empfundene Realitaetsnaehe wurden kontrolliert in bezug auf Stimulus Aequivalenz und Stress-Spezifitaet.

Entgegen der Vorhersage berichteten Hypertoniker weder mehr Angst noch wurden sie als sozial weniger geschickt beschrieben. Die kognitiven Reaktionsmuster jedoch diskriminierten zwischen den Gruppen: Hypertoniker nahmen weniger Stress wahr und zeichneten sich durch einen repressiv-defensiven Stil aus. Behandelte und unbehandelte Hypertoniker zeigten eine Hyperreaktion im systolischen Blutdruck, aber nicht im Herzschlag- Verhalten. Bezueglich des diastolischen Blutdrucks reagierten Kontroll- Versuchspersonen und behandelte Hypertoniker wie vorhergesagt,d.h., sie zeigten erhoehte Reaktivitaet bei hoher Stressbelastung wenn verglichen mit niedriger Belastung. Die unbehandelten

Hypertoniker jedoch zeigten eine Umkehr dieses Reaktionsmusters, da ihr diastolischer Blutdruck waehrend der hohen Stressbelastung nicht anstieg. Waehrend der niedrigen Belastung war allerdings eine signifikante Veraenderung festgestellt worden.

Die potentielle Interaktion eines repressiven kognitiven Stils und der Blutdruckveraenderungen werden diskutiert. Auf die Implikationen der Ergebnisse fuer kuenftige Forschung zum Bluthochdruck und Stress sowie pharmazeutischer Blutdrucktherapie wird ebenfalls hingewiesen.

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1.1 Introduction

The introduction will briefly describe the importance of social competence* for various psychiatric disorders and mental health at large.

A definition of social competence presented at an NIMH conference (Gladwin, 1967) comprised three distinct aspects: a flexibility in choosing mental or behavioral strategies to reach a given goal, an ability to use the resources that a social environment may offer, and effective reality testing. The impact that social interactions may have on psychological problems is elucidated by Gurin, Veroff and Feld (1960) who reported that 70 - 80% of individuals searching psychologic or psychiatric help experience difficulties with their spouse or family. There is multiple evidence that the ability to cope effectively with interpersonal difficulties may play a crucial role in psychiatric disorders. Zigler and Philipps (1960, 1961; Philipps and Zigler, 1961, 1964) have empirically verified the relationship between the impairment of interpersonal functioning and various psychiatric problems. They found that severe symptomatology was associated with minimal social competence, and that

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* Some clarification concerning the use of terminology may be helpful. The term social competence is conceived as a complex construct which integrates overt social behaviors (social skills) as well as physiological and cognitive functioning associated with social interactions. The term assertiveness will be used interchangeably when citing original publications. Overall it is suggested to use social competence as a global construct and to reserve the term 'social skills' only for overt behavioral responses in social situations.

patients with better premorbid social skills had a much better prognosis. Libet and Lewinsohn (1973) reported a significant association of social skills and clinical depression. Data are also available that indicate a close relationship between the quality of an individual's social networks and mortality rates (Berkman and Syme, 1979). It appears that social competence is a critical variable across different problem areas, and that it influences the prognoses of various disorders. These findings indicate that to a certain degree social competence has both concurrent and predictive validity for mental, and possibly physical health.

The literature on social competence is comprised of three major areas:

(1) Definitions of Social Competence;

(2) Components of Social Competence;

(3) Issues in the Measurement of Social Competence.

1.2 Definitions of Social Competence

Numerous researchers and clinicians have attempted to define social competence. These attempts tend to be of an ad hoc nature and the range of concepts and/or behaviors that have been included in these definitions is nonspecific. Early descriptions were particularly general (e.g., "all socially acceptable expressions of rights and feelings", Wolpe and Lazarus, 1966; "ability for self-expression", Liberman, 1972; "habit of emotional freedom", Lazarus, 1971); recently, however, definitions have become more complex, identifying different response classes and patterns.

Lazarus (1973) defined assertiveness as comprised of four separate skills:

(1) the ability to say "no";

(2) the ability to ask for favors or make requests;

(3) the ability to express positive and negative feelings; and

(4) the ability to initiate, continue and terminate general conversations.

Similarly, Galassi, Deleo, Galassi and Bastien (1974) specified the expression of positive feelings, negative feelings and self-denial as the three major response classes of assertive behavior. Kirschner (1976) distinguished six categories of assertion (discontentment, expression of positive affect, positive approach, dissatisfaction, disagreement, and refusal). Although not all existing definitions are presented, Salter's (1949) early view that assertiveness is a broad generalized trait appears to be supported within this literature. Factor-analytic studies using assertiveness inventories have been conducted to test the trait perspective of assertion (Bales and Zimmerman, 1971; Gambrill and Richey, 1975; Lawrence, 1970). All three studies have failed to yield a general factor but rather identified a number of factors that carried relatively equal weight. Rich and Schroeder (1976) concluded that these results suggest two possible interpretations. It could be that a trait view of assertion lacks support, or they may indicate that the inventories used for analysis were of limited value for this endeavor. Some clarification of the latter interpretation was presented in a factor-analytic study (Ullrich, DeMuynck and Ullrich, 1976) that had included different inventories, information from interviews with clients and case reports. In this analysis seven major factors were identified:

(1) general insecurity;

(2) anxiety to say "no";

(3) anxiety to make requests and assert oneself;

(4) feelings of guilt after expressions of assertion;

(5) overstated "niceness" and dependency on norms;

(6) anxiety of failure and being criticized;

(7) contact anxiety.

Given these findings, one may support the interpretation by Rich and Schroeder that some inventories may be less valuable for a factor analysis than a more complex approach to item collection (e.g., Ullrich, DeMuynck and Ullrich, 1976) and that even following a reduction from a dozen to seven factors of assertion a trait perspective does not appear to be supported. The difficulties with a global assertiveness construct led to definitions of social skill that are characterized by their high level of abstraction.

Rich and Schroeder's (1976) description of social skills does not specify content but describes conceptual characteristics of assertive behavior and exemplifies an abstract approach to a definition. They suggest that "assertive behaviors may be defined as skills that (a) are concerned with seeking, maintaining and enhancing reinforcements and (b) occur in interpersonal situations involving the risk of reinforcement loss or punishment". Given a global conceptualization like this, one may wonder how these skills could be operationalized and how one could arrive at testable predictions.

In the theoretical literature, it has been suggested (Mischel, 1968, 1973) that a response tendency can be predicted when individual differences and social context are known. Thus comparisons across studies can be made.

Empirical studies (Eisler, Hersen and Miller, 1973, 1975; Levenson and Gottman, 1978; Zeichner, Wright and Herman, 1977) support the situational

specificity argument. These authors noted a variety of variables that contribute to a better description of a given social situation. Levenson and Gottman developed and validated a questionnaire that differentiated between assertiveness deficits and dating anxieties. Subjects that were identified by the questionnaire as lacking assertion received assertion training and improved on skill and anxiety concerning assertion but did not change in their evaluation of dating skill deficits which had not been treated. Similarly, when dating deficiencies were treated, improvement in these skills was observed; however, the training did not lead to change in a general assertion measure.

Zeichner et al. (1977) also supported the view that assertiveness (operationalized as making requests and refusing unreasonable requests) and dating behavior differed on a number of critical variables. Eisler et al. (1973, 1975) found that the sex of the social partner and the familiarity with them influenced the outcome of assertion training.

These findings suggest that definitions of social skills distinguish between general assertiveness and abilities to engage in and maintain social contacts. Besides a potential distinction of assertive versus social contact skills, other factors have become salient from the above studies; these factors appear valuable for further research and may help categorize specific social situations:

- the sex of social partners and the familiarity with them;
- the level of activation that is necessary for a certain skilled response;
- the degree of affective involvement;
- the question of relevance for specific or general populations.

1.3 Components of Social Competence

A definition of a competent social response could include the necessary topographical features of overt behaviors, the individual's perception of the situation and ability to deal with the situation. These behavioral and cognitive aspects are discussed below.

1.3.1 The Assertive Response

The number of components that are presented in the literature as relevant for an assertive response is quite large. It covers non-verbal aspects (e.g., gestures, facial expression, length and intensity of eye-contact, distance from social partners) as well as verbal components (loudness and length of speech, deliberate use of the word "I", refusals without undue excuses and social "appropriateness" of response).

While there is some agreement regarding the utility of these components, the "socially appropriate content of the response" has been a focus of research. Rich and Schroeder (1976) concluded that the content of an appropriate response has to be seen as a function of the therapist's and the client's personal values, societal values and expectations, and the particular situation in which an assertive response is to be expressed. Considering the variety of factors that may contribute to the definition of a "socially appropriate" response, attention should be given to a careful assessment of situational characteristics. If the assertive response does not correspond with situational demands, the individual "risks" reinforcement loss or punishment" (Rich and Schroeder, 1976). This consideration is reflected in the distinction between aggressive and assertive

behavior (Alberti and Emmons, 1974; Lange and Jakubowski, 1976; Lazarus, 1971). An aggressive response may include a "standing up for one's rights" but this may also enhance the chances for punishment because of its potentially aversive character on others. It has thus become an essential part of assertion training to teach the discrimination between assertion and aggression (Lange and Jakubowski, 1976).

Although patient and therapist may generally agree on a given distinction (cf. Lange and Jakubowski, 1976), it should be noted that these decisions are of an arbitrary nature. Empirical derivations of appropriate content remain the exception in the social skills literature. Eisler et al., (1975) presented such an attempt with psychiatric patients. Male inpatients were evaluated on assertive expression and situational differences were identified on a variety of variables. The patients were reported to have found assertiveness easier when with strangers than with familiar individuals; this however was true only for negative assertion. Overall positive expressions of assertiveness were rated more skillful than negative ones. Also the patients (all males) talked longer to men than to women; they required behavior changes easily from female social partners, however not from other males.

A study of low-assertive college students (Galassi and Galassi, 1976) revealed that the mode of stimulus presentation (taped versus live) in assertion training and length of required response were important variables. Variations of the role-playing did not effect the content of the responses.

Situational effects on dating and assertive behaviors were investigated

by Zeichner et al. (1977). Significant differences on a variety of variables were identified. In the dating situation, subjects were found to spend more time talking to a familiar role player than to a stranger, eye contact was significantly longer with a "friend" whereas in assertiveness situations the reverse was observed. In role-plays that requested assertive responses, subjects gave less demand justification to "friends" than in a dating situation with a similarly familiar person. Comparing these results with the conclusion of Rich and Schroeder (1976) that behavior therapists "paid lip service to situationism, but otherwise treated assertiveness as a trait", it can be stated that some initial research points to important variables for consideration in future studies. These include the potentially antagonistic effect of familiarity on assertive versus dating behavior and the potential impact of the sex of the social partner (Eisler et al., 1975).

Given the difficulties with definition and identification of a general trait of social skills, it may be an appropriate research strategy to avoid the study of complex response classes and rather investigate more narrow scopes of social behavior. Examples of this research can be seen in the Schwartz and Gottman (1976) study which analyzed the ability to refuse unreasonable requests, or in a series of studies on dating behavior by Curran (1975, 1977). However, it is also possible to approach this issue from the opposite perspective, using for example unstructured, natural observations where the interaction of a client with his natural social partners could be recorded.

1.3.2 Characteristics of the Responder

The subjective perception of a social situation and its interaction with assertiveness is the focus of a number of research studies. Already early discussions of assertion considered covert mediating responses as important for assertive behavior. Wolpe (1958) noted the association of inhibitory anxiety and lack of assertiveness, suggesting that assertive behavior and anxiety are incompatible. Rich and Schroeder (1976) conclude that in addition to anxiety and various topographic variables, cognitive sets may be critical variables in social competence. There is a considerable number of studies that have systematically investigated "covert mediators", anxiety and topographic features in the assertive (or unassertive) responder.

Smith and Sarason (1975) investigated the effects of social anxiety on perception of and responses to negative interpersonal feedback. Using the Fear of Negative Evaluation scale, male and female subjects were divided into low, moderate and high anxiety groups and subsequently requested to role-play a situation in which they interacted with another person who had then rated them on a bi-polar adjective scale. The subjects were then presented with a negatively toned evaluation form, and were asked to discuss their feelings about the evaluation and the evaluator as if this had been their rating. A significant anxiety effect was obtained. The high and moderate anxiety groups rated the other's evaluation as being significantly more unfavorable than did the low group. Also the high and moderate anxiety groups indicated they would feel worse about the negative evaluation. Finally, the high anxiety subjects rated themselves as being

significantly more likely to receive such an evaluation than did the other groups. The only sex effect occurred on the personal feelings measure, where the females indicated they would feel worse.

High and low socially anxious men participated in two brief conversations with female confederates in a study of social anxiety and self-evaluation of interpersonal performance (Clark and Arkowitz, 1975). Each subject rated his own and other conversations in terms of social skill, anxiety and female's response. Additionally, ratings were evaluated by neutral observers. It was hypothesized that, compared with low anxious subjects, the high anxious subjects would under-estimate positive aspects of their performance (social skill and favorability of female response) and over-estimate negative aspects (social anxiety). Data for the ratings of social skill support this hypothesis, and the ratings for the data of the social anxiety were in the predicted direction. Results for the ratings of the female's response did not support the hypothesis. The results support the overly negative self-evaluations of the high anxious group, whereas the self-evaluations of the low anxious group were more positive and more consistent with the judge's evaluation.

Based on Wolpe's contention that assertive responses are incompatible with anxiety and are effective in overcoming neurotic fear, an inverse relationship between assertiveness and anxiety was predicted by Orenstein, Orenstein and Carr (1975). A sample of 250 males and 300 female college undergraduates completed the Rathus Assertiveness Scale (RAS). Results indicated that males were significantly more assertive than females. Based on the distribution of the RAS scores, three discrete non-contingent groups

(high, average and low assertive), comprising 86 subjects, were selected for further testing, which included the Maudsley Personality Inventory and the Fear Survey Schedule II. Findings from analyses of variance supported the hypothesis that assertiveness would correspond inversely and highly significantly with measures of neuroticism, trait anxiety and interpersonal anxiety for both males and females. Glasgow and Arkowitz (1975) demonstrated a naturalistic approach to the behavioral assessment of male and female social competence in dyadic heterosexual interactions. Male and female undergraduates who were either high (HFD) or low (LFD) in dating frequency were matched with opposite sex partners in a 2 x 2 design and compared on behavioral, self-report and partner rating measures of social competence and assertiveness. Neither total frequency nor reciprocal behavioral measures produced any between group differences. Physical attractiveness discriminated significantly between HFD and LFD groups. The importance of self-evaluations was supported in males rather than a social skill deficit hypothesis. By contrast, LFD females seemed characterized by a social skill deficit rather than overly negative self-evaluations.

A second paper on the same issue was published in 1975 (Arkowitz, Lichtenstein, McGovern and Hines). This time only male students, either in a HFD or a LFD condition, were compared on a variety of self-report, peer rating and behavioral measures of social competence in heterosexual interactions. The self-report measures of social anxiety and peer ratings of anxiety and skill showed highly significant differences between the groups. On an audiotaped social performance task HFD subjects responded with shorter latencies and more words per response than did the LFD subject.

There were relatively few behavioral differences between the groups on two social performance tasks involving live interaction with a female confederate. Only rated social skill and number of silences in the conversations significantly discriminated between the groups. In perspective of the results of these two studies arises the question of the usefulness of simple frequency measures (such as number of dates).

In a task analysis Schwartz and Gottman (1976) investigated assertion problems that were conceptualized in three sets of situations requiring refusal of an unreasonable request. A low assertive group differed from a medium and a highly assertive one in a behavioral test that required social skills. However, no difference was found in a measure of pulse-rate--as an indicator of anxiety--between the groups, but the low assertive subjects perceived the anxiety as much stronger. Another distinction could be made concerning the self-verbalizing behaviors of the group members; the low-assertive subjects produced more negative and less positive self-evaluations.

The sense of timing, a skill deficit in heterosexual socially anxious males, was studied (Fischetti, Curran and Wessberg, 1977) in groups of high socially anxious, low socially skilled (socially incompetent) and low socially anxious, high socially skilled (socially competent) undergraduate males, selected using both a self-report measure of social anxiety and behavioral rating of both skill and anxiety in a simulated role-play of a dating situation. Selected subjects were then requested to (1) listen to a 10 min. videotape of a female speaker discussing her life and (2) press a switch whenever they felt a response would communicate understanding or

rapport. The hypothesis that socially incompetent and competent individuals would respond with the same frequency but would differ in the timing or distribution of their responses was affirmed. These results suggest timing of responses to be an important component of social skill and called into question the adequacy of using frequency counts of behaviors to investigate the specific nature of social skills.

Differing from other studies above where usually heterosexual skills were assessed in males, Greenwald (1977) selected women that were frequently or rarely dating. The ratings of female daters by male and female judges revealed significant differences between high and low frequency dating groups on global measures of physical attractiveness in the waiting room and role-play situations. There were some significant findings for global measures of social skill, but not for social anxiety. Behavioral differences were only very few. In the peer interaction, female subjects were able to differentiate high and low dating men, but the men were unable to discriminate the high and low dating women in these measures.

From these studies three major factors that characterize the socially incompetent client emerge:

(1) conditional anxiety where the appropriate skill is known but the performance is inhibited by anxiety;

(2) skill deficit where it is assumed that the skill either has never been learned, or is no longer in the repertoire because of disuse, or is applied indiscriminately;

(3) inappropriate cognitions with blocking functions which may incorporate:

- unrealistic expectations of negative consequences;
- unrealistic performance expectations;
- negative self-evaluations;
- misperception of own performance in systematically more negative directions;
- unrealistic needs for approval.

Individuals may show different patterns of deficits on these three variables. In some instances skill deficits might be the most prominent while in others the skill repertoire may be appropriate whereas assertive performance is blocked by conditional anxiety and/or inappropriate cognitions.

1.4 The Measurement of Social Competence

Three modes of assessment have been used to measure the various components of social competence: paper and pencil, psychophysiological evaluation, and behavioral assessments.

1.4.1 Paper and Pencil Tests

Rich and Schroeder (1976) reviewed the validity and reliability of the most commonly used paper and pencil evaluations of social competence. These include:

- A-S Reaction Study (Allport, 1928)
- Guilford-Zimmerman Temperament Survey (Guilford and Zimmerman, 1956)
- Wolpe and Lazarus Assertiveness Questionnaire (1966)
- Action Situation Inventory (ASI), (Friedman, 1968)
- Lawrence Assertive Inventory (LAI), (Lawrence, 1970)

- Rathus Assertiveness Scale (RAS), (Rathus, 1973)

- College Self-Expression Scale (CSES), (Galassi et al., 1974)

- Conflict Resolution Inventory (CRI), (McFall and Lillesand, 1971).

It was concluded that all but one were either clearly outdated, measured far too general aspects, or simply did not possess adequate reliability and validity. The Conflict Resolution Inventory (CRI) remains the only empirically valid measure of assertiveness. In contrast to other inventories, the CRI measures a narrow scope of one assertive response class: the ability to refuse unreasonable requests.

An inventory not included in Rich and Schroeder's review is the Social Anxiety and Distress Scale (SAD) by Watson and Friend (1969). Watson and Friend give unusual attention to the collection of homogeneous items and also controlled for social desirability in test responses. The SAD assesses self-report of social anxiety and avoidance behaviors. Test-retest reliabilities over two samples were found to be at $r = .68$ and $r = .79$ respectively. Crossvalidation with other psychological measures indicated numerous significant relationships, for example correlations between SAD and Taylor's Manifest Anxiety Scale were $r = .54$, with the S-R Inventory of Anxiousness $r = .45$, and with the affiliation scale of the Personality Research Form a correlation of .76 was found.

In addition to the factors of skill and anxiety, cognitive deficits characterized the socially incompetent client (cf. Clark and Arkowitz, 1975; Schwartz and Gottman, 1976). Cognitive deficits have been investigated in the context of a treatment outcome study. Linden, Schertel and Stark (1978) measured cognitive changes that occurred during a social

competence training. The instrument used was a questionnaire that measured the frequency with which subjects used short self-evaluative statements. This inventory (IPK-S) was developed in Germany by Quitman, Tausch and Tausch (1974) and Boellner, Tausch and Tausch (1975) and found able to discriminate neurotic from normal populations on the basis of their self-communications. A pilot-study with a treatment package (including behavior analysis, modification of self-verbalizations, behavior rehearsal in the lab, and controlled practice in the natural environment) resulted in significant changes in client's self-verbalizations over all six categories (self-contentment and discontentment, self-encouragement and discouragement, mood state positive and mood state negative) of the cognitively based questionnaire.

Parallel with the development of the SAD, Watson and Friend (1969) also constructed an inventory to assess cognitive functioning in social situations, the Fear of Negative Evaluation Scale (FNE). The FNE was as carefully constructed as the SAD, homogeneity of items and control of social desirability were major objectives in the test development. Test-retest reliabilities were found to be .78 and .94 for the two samples used. Cross-validation with other measures indicated many significant relationships: FNE and Taylor's Manifest Anxiety, $\underline{r}$ = .60; FNE and S-R Inventory of Anxiousness, $\underline{r}$ = .47; and finally the social approval scale of the Personality Research Form correlated with $\underline{r}$ = .77.

1.4.2 Physiological Measures

Physiological measures have been used in two assessment-type studies (Borkovec, Stone, O'Brien and Kaloupek, 1974; Weerts and Lang, 1978) and also in three treatment outcome investigations (Kanter and Goldfried, 1979; McFall and Marston, 1970; Twentyman and McFall, 1975).

Borkovec et al. were able to discriminate socially anxious and non-anxious subjects as defined by self-report and role-play assessment, on the basis of heart-rate increase. HR arousal showed substantial differences between the groups and no tendency to habituate with repeated social role-play exposures. Moreover these differences were most prominent during the anticipatory periods of the experiment.

Weerts and Lang (1978) compared HR, GSR and ocular activity when spider phobic and socially anxious college students imagined fear scenes with both types of fear stimuli. The results suggested that imagined fear scenes can be sufficient in leading to significant physiological arousal. Arousal also appeared significantly greater when the groups responded to their individually relevant fear scenes.

McFall and Marston (1970) monitored pulse-rate in addition to conducting questionnaire and role-play assessment in an attempt to evaluate different forms of Social Skills Training in a college population. Pulse-rate was measured prior to and following the role-playing situation, both at pre and post treatment periods. Pulse-rate at post-treatment was found to be significantly lower in the experimental conditions than in the control. This result, however, applied only to the measurement following the role-plays. Anticipatory anxiety was unchanged in all treatment conditions.

The same pulse-rate measure was used by Twentyman and McFall (1975) although measures were recorded via a plethysmograph. The study included a comparative assessment of shy and confident male college students in dating situations and also presented the results from Social Skills Training offered to the shy subjects. Physiological responses were measured during a base-line, an instruction, a performance, and a resting period of a contrived in-vivo behavior test. Base-line and resting pulse rates did not differentiate the shy and confident subjects, but significant differences were obtained during periods when subjects listened to the instructions and when actually performing the task. Following three hours of SST, the identified shy subjects were tested again. Results suggested that the treated subjects showed a more rapid habituation and lower levels of arousal in the test situation than did untreated controls.

Recently, Kanter and Goldfried (1979) investigated the differential effect of rational restructuring and desensitization in reducing interpersonal anxiety. Pulse-rate measurement (taken manually or with a pulsemeter) served two functions: (a) to determine the anxiety-arousing effect of a contrived conversation task as a behavioral performance measure and (b) as a measure of treatment effectiveness, administered at pre and post test. It was observed that during the behavior test a significant increase occurred between the resting state and the moment prior to the conversation, but after having received the instructions. A significant decrease occurred at the end of the assessment; this was equally observed at the pre and the post test. Parallel self-reporting confirmed the anxiety arousing effect of the contrived task. Concerning treatment effects,

no significant change in pulse-rate was observed when comparing pre and post test data.

Caution in interpreting the above results is necessary because differing measures (pulse-rate, heart-rate, GSR) were applied to moderately anxious populations with quite diverse fears (dating, interpersonal situations, speech, spiders). Equally, given the limited number of studies investigating physiological arousal, conclusions can only be suggestive. Nevertheless, a pattern emerges across these studies. Apparently heart and pulse-rate measures allow a discrimination of high and low anxious subjects when the fear stimuli were relevant to their self-reported anxieties. A standardized presentation of fear stimuli in imagination or in contrived role-plays was sufficient to produce significant physiological arousal even in analogue-type college populations. This is supported by the repeated observation (Borkovec et al., 1974; Twentyman and McFall, 1975) that high and low anxious groups did not differ during base-line or resting periods prior to stimulus presentations. Treatment of a SST, Desensitization or Rational Restructuring type tended not to produce substantial decreases of physiological arousal. While at least two out of three studies (McFall and Martson, 1970; Twentyman and McFall, 1975) reported some decrease in arousal due to treatment, following the role-play performances, anticipatory anxiety appears quite resistant to change.

1.4.3 Behavioral Measures

Samples of real-life behavior can be obtained through role-play situations in the laboratory. Role-play assessments usually consist of

problematic, naturalistic situations that are presented in a standardized manner. The subject is then asked to respond in the laboratory as he/she would do in real-life; performance is then video or audio taped and later rated for social skill by trained, blind observers. Thus role-play tests imply two distinguishable steps: (a) the choice of relevant situations for role enactment in the lab and (b) the rating procedure for observed skill on the basis of the performance recordings.

Numerous methodological problems may limit the validity of role-play tests. Spencer (1978) delineated two types of role-play (empirical and hypothetical), and discussed the threats to internal and external validity that these types of role-play pose. Empirical role-play was defined by two criteria: (1) the role must be described by the experimenter prior to the beginning of the experimentation and (2) the procedure must permit independent monitoring, such that role enactment can be verified by means other than post-hoc reference to the dependent variable. Hypothetical role-play is characterized by the lack of independent performance monitoring. To do empirical role-play, the experimenter has to be able to discard those subjects' data whose behaviors indicated they had not adopted the role prescribed to them.

Many studies on social competence had used role-play that would be considered hypothetical according to the above definition (i.e., independent monitoring was missing); thus they are not internally valid. Three studies (Kanter and Goldfried, 1979; McFall and Marston, 1970; Twentyman and McFall, 1975) that employed parallel physiological measures, however, indicated that the role adoption of subjects in a role-play test was

'empirical' (i.e., subjects in role-play situations showed significantly increased physiological arousal), and thus support the internal validity of role-play tests for social competence assessments. A further methodological procedure for increasing the internal validity of role-play could be operationalized by assuring individual relevance before situation enactments are prescribed. This option, however, has not been used to date in social skills assessment.

The issue of external validity remains in both types of role-play. External validity increases with the similarity between experimental and actual situations. When role-play situations are chosen in an ad-hoc manner by the experimenter, external validity can only be inferred and remains highly speculative. Unfortunately, many of the role-play tests are of an ad-hoc nature (Hersen and Bellack, 1977).

A few behavioral tests appear to be more carefully constructed: Eisler et al. (1973, 1975), Goldsmith and McFall (1975), McFall and Marston (1970). Goldsmith and McFall's Interpersonal Situation Inventory was empirically derived. The items were cross-validated on a sample of in-patients that had not been involved in the study before. The responses finally chosen as test items were then role-played by staff members. These role-plays were rated for skill.

McFall and Marston (1970) had solicited 2,000 situations from college students and then reduced to 80 non-redundant items. These were administered to a sample of 60 students and results were factor-analyzed; those with the highest factor loadings were cross-validated on additional 45 students and again reduced to a final set of 16 situations for role-play.

In Eisler et al.'s study (1973, 1975), 30 male psychiatric inpatients role-played 14 social situations each. According to their rated performance, the subjects were divided into two groups scoring either below or above the median. Five out of nine components were found to differentiate the low assertive from the high assertive group: more pronounced affect, lengthier response, louder speech, shorter response latencies, lower compliance and requesting more behavior change. When 16 positive assertion situations were added and the situational context varied (familiar-unfamiliar, male-female) nine out of twelve components discriminated the two groups, interpersonal behavior varied as a function of the social context.

External validity could further be enhanced when role-play situations are individualized and based on relevant events in the subjects' naturalistic environment. Self-monitoring of actual social situations could provide the data from which to make choices for rehearsals in the lab. Previous studies tended to avoid this in order to maintain a normative character in measurement.

Given that the choice of situations and the role-play test itself are sufficiently reliable and valid, it is also the rating of social skills that demands methodological attention. To permit the evaluation of reliability of measurement, blind raters are usually employed and most studies use at least two independent raters for each scene so that interrater reliabilities can be computed. Despite the fact that social skills are a rather vague notion, rater agreement is often found quite satisfactory; reliabilities of $r = .80$ are repeatedly observed. There is a

tendency that molar measures, such as overall effectiveness obtain higher reliability coefficients than molecular ones, such as eye-contact or number of smiles (Curran, 1978). Empirical studies have identified behaviors that reliably differentiated socially skilled from unskilled individuals. These include: affect, length of response, loudness of speech, response latency, willingness to comply, number of behavior change requests made (Eisler et al., 1973, 1975), sense of timing (Fischetti, et al., 1977), conversation structure, speech delivery, conversation style, body language, assumed personality trait (relaxed versus anxious), conversation content (Conger, Wallander, Ward and Mariotto, 1980).

Cross-validation of skill ratings and anxiety indicated an inverse relationship between these two variables (Arkowitz et al., 1975). Equally, self-report of social skill was a valid predictor of observed social skill in a study on the ability to refuse unreasonable requests (Schwartz and Gottman, 1976). Both studies provide some support for the concurrent validity of social skills ratings by blind observers. Some further, although inferential, evidence for the validity of a social skills assessment through trained observer ratings is provided by the observation that the application of social skills training consistently leads to improvement of observed socially skilled behaviors (cf. Linden and Wright, 1980; Rich and Schroeder, 1976; Shepherd, 1978).

Optimally, a standardized and comprehensive rating system (for example the Rating of Behavior in Social Situations by Shepherd, 1977) would be employed in a future, longitudinal study identifying the predictive

validity of the social skills paradigm. Studies by Zigler and Philipps (1961, 1964) have supported the predictive validity of the social competence assessment on the prognoses of psychiatric disorders.

In conclusion, it should be emphasized that role-play tests remain the only available technique for evaluation of behavioral performance in social interactions whenever naturalistic observation is impossible or cannot be sufficiently controlled. For this reason, it is to be recommended that role-play tests be improved methodologically in the way suggested above. Abolition cannot be the goal as long as better techniques are not available to replace role-play.

2.0 Hypertension: An Overview

Hypertension is most commonly defined as diastolic pressure above 90 mmHg (Guyton, 1971) with pressures from 90 to 95 mmHg being referred to as borderline hypertension, and from 96 to 105 mmHg as mild hypertension. Between 80% and 90% of all cases of hypertension fall into the mild hypertension range. Prevalence estimates vary according to definition and measurement used. About 15% of the U.S. population are reported to have a blood pressure (= bp) of 160 mmHg systolic/95 mmHg diastolic or higher (according to the WHO definition they are hypertensive). This figure is the equivalent of 23 million people in the U.S. alone (Weinstein and Stason, 1976). Retrospective and prospective analyses have identified various risk factors in cardiovascular disease (= CVD) and have shown hypertension (= ht) to be the most significant risk factor in the development of strokes, congestive heart failure, renal insufficiency and atherosclerosis. Hypertension is also believed

to be a major risk factor for coronary heart disease and myocardial infarction. Cardiovascular disease is the leading cause of death in the United States (U.S. Public Health Service, 1974). Other industrialized countries report comparable data. These figures suggest the need for furthering the understanding and treatment of hypertension. Below the common modes of hypertension treatment and their limitations are described and a review of the literature on its etiology is provided. Emphasis is placed upon psychological and psychophysiological factors in mild hypertension.

2.1 Treatment of Hypertension

Major therapeutic approaches to hypertension include pharmacologic treatment, diet modification and behavioral methods such as relaxation, biofeedback and meditation, and psychotherapeutic techniques.

2.1.1 Drug Therapy

Drug therapy is the most frequently used approach in hypertension treatment and aims at the direct reduction of arterial blood pressure. This symptomatic approach to hypertension treatment is not ideal but becomes necessary because the exact mechanism responsible for the pathogenesis and maintenance of essential hypertension which represents approximately 90% of all hypertensives (Weinstein and Stason, 1976) remain unclear.

The reduction of blood pressure, however, has been demonstrated to affect the prognosis of stroke (cf. Veteran Administration Studies, 1967; 1970; 1972). Drugs in common use for blood pressure control are diur-

etics, the rauwolfia alkaloids, vasodilators, alpha-methyldopa, adrenergic blocking agents and beta-blockers. The objective in prescribing these drugs is the reduction of vascular resistance, the lowering of cardiac output or both. Prospective collaborative studies indicate that pharmacological treatment leads to significant reductions of certain complications of hypertension (VA Cooperative Study Group on Antihypertensive Agents, 1967; 1970; 1972). The percentage of hypertensives in whom blood pressure is considered "in control", however, is limited. The National High BP Education Program, (1973) reports that only half of the patients treated with pharmacotherapy benefit substantially. The higher the pre-treatment pressure, the larger the benefits from drug treatment, with mild and borderline hypertensives being the least effected (Agras and Jacob, in press).

Treatment does not provide significant protection against atherosclerosis of the coronary arteries which is a complication of high blood pressure (Freis, 1978). Hypertension possibly produces irreversible changes in the arterial walls that predispose to the development of atherosclerosis, regardless of the subsequent level of blood pressure. This would suggest that effective prevention of atherosclerosis necessitates an intervention at an early age with the goal of keeping blood pressure at the lowest level possible.

The application of pharmacological treatments, however, carries with it numerous problems that clearly limit its potential value for controlling hypertension. Drug therapy has only a modulating effect on high blood pressure, i.e., when the drug treatment is stopped or

interrupted, the blood pressure rises again. Consequently, drug therapy must be maintained for many years and often for life. This fact has ramifications on many levels. Side effects are of special concern to the pharmaceutical control of blood pressure. Reactions to drugs were, at times, found to be only minor and transient, such as lethargy, diarrhea, skin rash and nausea. However, more severe and disabling effects, such as impotence, depression and possibly cancer have been associated with drug therapy (Weinstein and Stason, 1976). For example, in a retrospective study of 387 hypertensive patients, 26% developed a depression, compared to only 5% of hypertensives not taking medication (Weinstein and Stason, 1976). These authors also reported an incremental probability of .50 for sleepiness, and a score of .33 for impotence in another group treated with reserpine (a rauwolfia alkaloid). Up to 70% of patients complain of drowsiness when first started on treatment with methyldopa (Weinstein and Stason, 1976).

These negative side effects are probably a major contributor to the poor compliance with drug treatment that many researchers have observed (Blackwell, 1973; Caldwell, Cobb, Dowling and deJongh, 1970; Haynes and Sackett, 1974; Podell, 1975). Up to 50% of hypertensives under treatment fail to keep follow-up appointments; 50 - 60% do not comply regularly with their prescribed medication; 29 - 50% of known hypertensives are not taking any medication (Harris, Louis and Associates, 1973).

The negative impact of the observed side effects is particularly striking in the treatment of mild hypertension, where benefits, if

present, are relatively small. Finally, since hypertension therapy is of a long duration, the development of tolerance to the drug and decreasing effectiveness have to be taken into consideration.

In regard to the high prevalence of hypertension in the general population (i.e., 15% in the U.S.), the issue of treatment cost becomes quite important. Stokes and Charmichael (1975) calculated annual costs of 327 US$ for each patient; Weinstein and Stason (1976) quote costs ranging from between 157 and 411 US$ per annum, depending on the number of drugs prescribed. These authors conclude their cost-benefit analysis of drug treatment indicates that even if pharmacotherapy would be proven effective for mild hypertension, it would be more than twice as costly as that of moderate and severe hypertension per unit of health benefit achieved. Therefore it could not be considered a cost-effective use of available health resources.

2.1.2 Non-Pharmacological Treatments

The effect of biofeedback, relaxation-type techniques and psychotherapy as treatments for high blood pressure are discussed below. Biofeedback has been investigated as a method for self-regulated blood pressure control. The application of biofeedback is based upon the finding that to a certain degree visceral learning and thus self-control of blood pressure is possible. Similarly, relaxation type techniques (yoga, autogenic training, transcendental meditation, etc.,) have been applied because they are associated with decreased sympathetic arousal, which in turn tends to lead to lowered blood pressure. Both biofeedback and relax-

ation techniques are reported to produce modest albeit usually significant decreases in blood pressure (Shapiro, Schwartz, Ferguson, Redmond and Weiss, 1977; Seer, 1979); the magnitude of change produced by the two techniques is strikingly similar. Seer reviewed 20 studies of biofeedback, relaxation and meditation in the treatment of hypertension and presented change scores in tabular format. If one takes only the change scores from the most effective treatment groups (usually combinations of biofeedback and relaxation/meditation), a range from -1 to -26 mmHg systolic (mean -11.5 mmHg), and -2 to -15 mmHg diastolic (mean -7.9 mmHg) is found. These studies usually are laboratory based and do not measure the transfer of training into the natural environment. This evaluation of clinical utility, however, is necessary to judge the positive long term impact that behavioral techniques might exert. A paucity of controlled clinical research has investigated this issue. Three recent controlled studies (Patel and Horwitz, 1977; Surwit and Shapiro, 1976; Walsh, Dale and Anderson, 1977) actually indicate a lack of generalization from the lab to the patients' natural environments.

2.1.3 Traditional Psychotherapy

Traditional psychotherapy as a method for lowering blood pressure has been derived from two theoretical concepts:

(1) since anxiety raises blood pressure, relief or decrease of anxiety through psychotherapy should also lead to lowered blood pressure;

(2) based on Alexander's (1939) notion of the hypertensive as unable to handle aggressive and hostile impulses, dynamic therapy is designed to provide a solution to the underlying conflicts and thus lead to improvement in the hypertension problem.

Two studies have investigated the efficacy of psychotherapy as a hypertension treatment (Moses, Daniels and Nickerson, 1956; Reiser and Brush, (1951) and the results overlap with what has already been said about the efficacy of biofeedback and relaxation. As well, the clinical utility of this approach is limited through the necessary selection of patients for analysis, the extraordinary length and the high cost of therapy.

In conclusion, treatment approaches to hypertension have led to quite unsatisfactory results especially when one considers the high prevalence of the disease and its impact on life-threatening cardiovascular disorders. Promising techniques, such as relaxation training (which is relatively cheap and implies few, if any, side effects) have not yet been proven effective. Pharmacotherapy which has been found useful (although limited for mild and borderline hypertensives), in contrast, is plagued with various side effects, lack of compliance and high financial cost. Therefore, innovative techniques based upon an empirical understanding of hypertension which result in long term control of blood pressure are needed.

2.2 Etiology of Hypertension

Gutman and Benson (1971) in their review of psychophysiological factors in hypertension concluded that "in spite of the high prevalence and clinical significance of arterial hypertension, relatively little is

known regarding its etiology". A small portion of cases can be attributed to secondary causes: renal vascular disease, adrenal cortical and medullary overactivity, coarctation of the aorta, eclampsia of pregnancy, and cerebral disease. Approximately 90% of patients with hypertension are classified as "essential", which by definition indicates no known etiology.

In theoretical models of hypertension (Gutman and Benson, 1971; Kaplan, 1978; Patel, 1977; Pickering, 1968; Weiner, 1977), there is a general agreement that an interaction of hereditary predisposition and environmental factors contribute to hypertension. The environmental stimuli affect the central nervous system which in turn influences blood pressure. In the following, physical factors that inter-relate with a hypertensive response (predisposing and situational) will be reviewed separately from psychophysiological reactivity to environmental stimuli.

2.3 Physical Factors in Hypertension

A variety of physiological mechanisms contribute to normal hemodynamic functioning in humans. Blood pressure is primarily determined by cardiac output and peripheral resistance. Renal retention of salt and water, plasma volume, hormonal and enzyme activity (catecholamine, ACTH and renin) also appear to be involved. Recent research (Kaplan, 1978; Patel, 1977; Shapiro, 1973; Weiner, 1977) indicates that no single physiological disturbance in the pathway of hemodynamics can fully account for the elevated blood pressure in all forms of Essential Hypertension. Disturbances can be found in one or many of the various systems

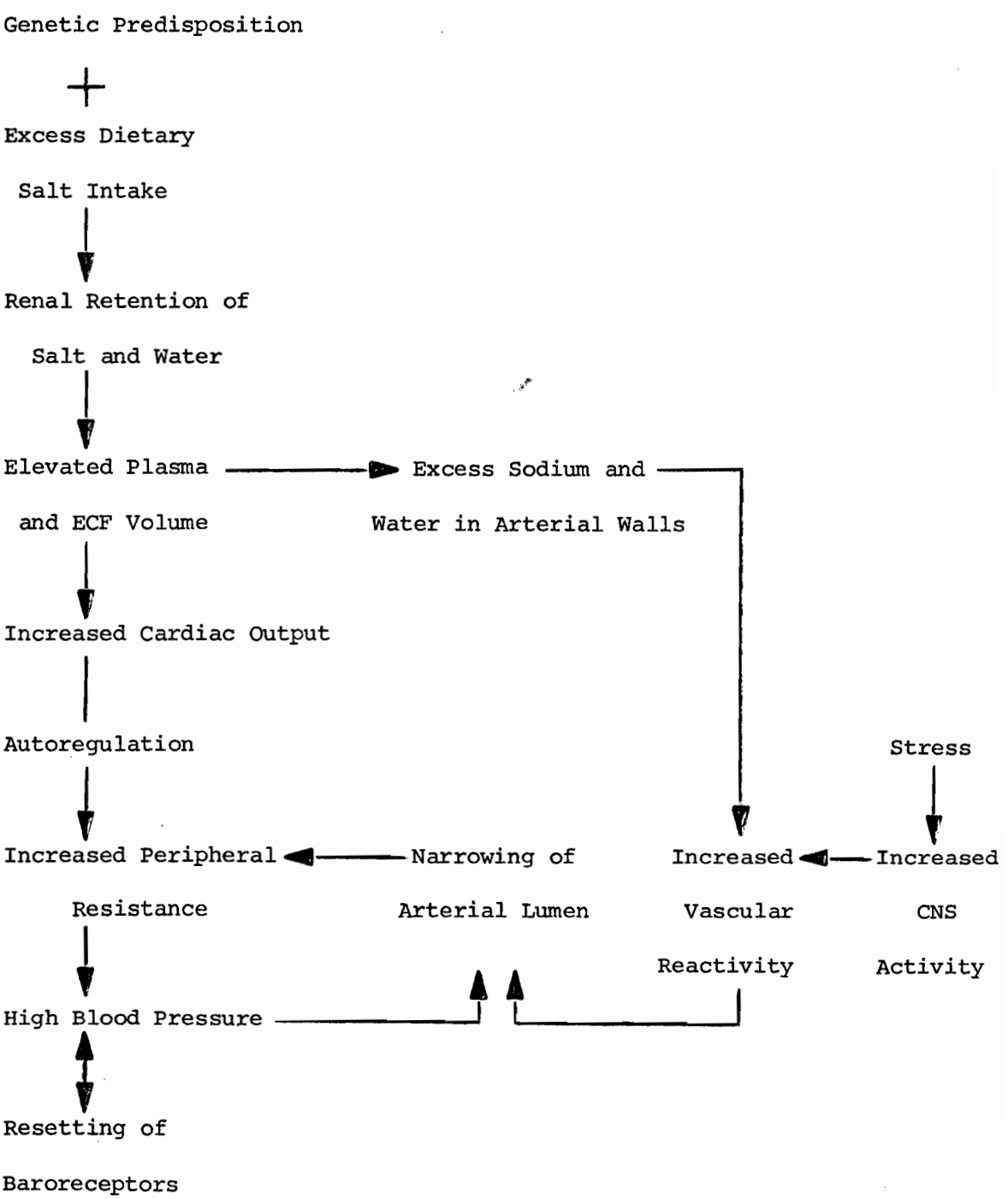
that are involved in the regulation of blood pressure.

The mechanism most frequently described is : stress-- a genetically determined hyperreactivity -- intermittent rise in blood pressure -- structural changes in the resistance vessels -- permanent hypertension. A schema of the possible pathogenesis of hypertension is added (figure 1) and illustrates the above description of interacting factors. This overall schema requires further explanation. The term 'stress' or more accurately 'stressors' represents situational factors in the environment that can contribute to the hypertensive response. The organism is exposed to environmental stimuli that are perceived by the sensual organs; the electrical stimulation reaches the cortex and increased sympathetic nervous system arousal follows. The hypothalamic region in the brain appears to be responsible for the transformation of environmental stimulation into cardiovascular responses. Karplus and Kreidl (1927) indicated that blood pressure is strikingly increased by electric stimulation of the hypothalamus. Later, Folkow, Heymans, and Neil (1965) reported that stimulation of definite areas in the hypothalamus and the midbrain --i.e, the pernifornical region in the lateral hypothalamus, and parts of the tegmentum and central gray matter of the midbrain-- not only caused an increase in blood pressure but indeed elicited a complex pattern of sympathetically mediated cardiovascular changes. This pattern consists of an increase in arterial pressure, cardiac stimulation with an increase in cardiac output, heart rate, and stroke volume.

The cardiovascular pattern that Folkow et al. (1965) describe is thought to represent the circulatory concomitant of emotional behavior and prepares the circulatory system for defense reactions (flight/attack) in

Figure 1

Possible Pathogenesis of Hypertension



response to the environmental stimulation (Hess and Bruegger, 1943). Thus, the interaction of environmental factors and intermittent rises in blood pressure can be described.

Further explanation is necessary regarding structural changes in resistance vessels which finally contribute to maintenance of elevated blood pressure levels; i.e., permanent hypertension. A key role in this process is attributed to the baroreceptors. In healthy individuals baroreceptor reflexes maintain arterial pressure within a fixed range. Increased baroreceptor nerve activity that results from a rise in intra-arterial pressure causes inhibition of vasomotor discharge over the sympathetic nervous system and simultaneously increases cardiac vagal activity; the resultant vasodilation and cardiac slowing thus oppose the rise in pressure and act to return pressure to normal.

There is multiple evidence that baroreceptor functioning may be dysfunctional in hypertensives. Folkow and Rubinstein (1966) produced moderately sustained hypertension in conscious rats by chronic daily stimulation of the 'defense area' in the hypothalamus. Animal research (cf. McCubbin, Green and Page, 1956; Sleight, Robinson, Brooks and Rees, 1975) indicates that baroreceptor discharge was reset at a higher level in hypertensive animals. The resetting of the baroreceptor heightens the threshold for the reflex functioning. The receptor in a hypertensive dog, for example, did not start to fire until a pressure level was reached that would have produced a continuous discharge in a receptor from a normotensive dog (Sleight et al., 1975). Apparently, baroreceptor reflexes function differently, (i.e., may be reset at a higher level) in hypertensives than in normals; however, the baroreceptor resetting phenomenon is not yet fully understood.

Findings from animal research suggest that acute rises in blood pressure and subsequent baroreceptor activation may in fact have biologically reinforcing properties (Dworkin,Filewich, Miller and Craigmyle, 1979). Dworkin and his coworkers found that when blood pressure was raised by an infusion of phenylephrine, rats showed less running to terminate or avoid noxious stimuli than during saline infusions. This effect was not seen in rats with denervated baroreceptors. Such a potential learning mechanism would be plausible in explaining a baroreceptor threshold change in hypertension.

Feinleib, Garrison, Borhani, Rosenman and Christian (1975) analyzed data from a variety of empirical studies investigating the question of hereditary predisposition to hypertension. While a close relationship of blood pressure values was found among monozygotic twins ($\underline{r}$ = .55, sys. blood pressure; $\underline{r}$ = .58, dia. blood pressure), the correlation coefficients were considerably lower when parent and sibling relationships were used as predictors ($\underline{r}$ = .16, sys. blood pressure; $\underline{r}$ = .19, dia. blood pressure). Although the hypothesis of hereditary predisposition is moderately supported (i.e., the correlations were significant), these coefficients can only account for a minimal portion of the variance in blood pressure only.

A number of other physical factors are also reported to be associated with blood pressure; factors as age (blood pressure tends to increase with age), sex (males have higher blood pressure until about the age of 50 when these trends reverse and women become more hypertensive), weight (obesity was found to be associated with hypertension), serum

cholesterol, exercise and cigarette smoking are considered to influence blood pressure.

Extensive data regarding the relationship of these variables with blood pressure levels were presented by Stamler, Berkson, Dyer, Lepper, Lindberg, Paul, McKean, Rhomberg, Schoenberger, Shekelle and Stamler (1975). Stamler and his coworkers analyzed the results from four epidemiological studies in Chicago that are characterized by impressive sample sized ($\underline{N}$ = 13,469; $\underline{N}$ = 21,024; $\underline{N}$ = 1,730; $\underline{N}$ = 787, respectively). The variables investigated were relative weight, resting heart rate, plasma glucose after oral glucose load, serum uric acid and cholesterol, current cigarette smoking and age. In all four populations relative weight, heart rate and plasma post-load glucose were independently related to blood pressure (ranging from r = .10-.40). Equally serum acid was correlated with blood pressure (ranging from $\underline{r}$ = .05 - .22). Findings with respect to cholesterol were generally negative and also no relationship could be established with cigarette smoking and blood pressure. Multiple linear regression analyses indicated that about 20 - 25% of intra-individual variability in blood pressure was 'explained' by the sum of these variables under investigation.

In conclusion, known physical contributors to hypertension can account for only a limited portion of the total variance in blood pressure, namely 20 - 25%, possibly a few percent points could be added in consideration of hereditary factors. The remaining variance (far more than half) will have to be explained by other factors. This find-

ing warrants the attention that has been given to psychological factors and their interaction with blood pressure changes.

2.4 Psychophysiological Factors in Hypertension

Repeated psychological stress is considered a factor in the etiology of hypertension (Cobb and Rose, 1973; Kaplan, 1978; Weiner, 1977). Data on the role of stress in hypertension has been obtained from four different areas of research:

(1) epidemiological studies;

(2) the study of personality types in hypertension;

(3) studies of physiological reactions to lab induced stress; and

(4) blood pressure reactivity in naturalistic settings using ambulatory measurement.

2.4.1 Epidemiodogical Studies

Epidemiology investigates the environment for explanatory factors and attempts to relate social and psychological factors to blood pressure. In these studies, stress has been conceptualized in a relatively objective way as generally observable, profound and frequent changes in one's life, or one's social and professional environment, that demand skilled and repeated adaptation (Holmes and Rahe, 1957). This type of research is exemplified in studies of psychological adjustments following migration. A comprehensive review of epidemiological studies on hypertension has been presented by Henry and Cassel (1969). These

authors reviewed 18 epidemiologic studies and attempted to analyze the social and psychological environments of subjects in the respective populations. Due to the complexity of their undertaking, conclusions are of a suggestive nature. Henry and Cassel had concluded that increased blood pressures were typically observed in industrialized countries and urban environments. Gutman and Benson's (1971) review of epidemiological research in hypertension confirmed the position that gross demographic variables, such as socio-economic mobility and urbanization, are related to elevated systemic arterial blood pressure. Any attempt, however, to specify the psychological processes that may mediate the influence of demographic characteristics and blood pressure remain speculative.

Syme and Torfs (1977) emphasize the tentative nature of these inferences: "there is no doubt the blood pressure varies among and between different population groups and there seems little doubt that variations in life-style are associated with these differences". However, this literature has produced numerous contradictions and failures to replicate certain earlier findings.

These conclusions indicate a lack of psychosocial specificity in hypertension and can give little help in suggesting appropriate treatments or necessary environmental changes. The high prevalence of hypertension in lower socio-economic classes, for example, gives little indication for the specific etiology of hypertension because virtually every cause of death and disease occurs more frequently in this group (Syme and Torfs, 1977). The search for more specific mediating factors

is necessary.

2.4.2 The Study of Personality Types in Hypertension and Cardiovascular Reactivity to Stress*

Epidemiological studies focus on large groups of hypertensives and attempt to associate generally known stressors relevant to these groups with a maladaptive cardiovascular pressor response. Because of the emphasis on groups of hypertensives, little is known about individual characteristics. In contrast, several studies have investigated personality in an attempt to detect trait-like characteristics of hypertensives which may contribute to the etiology of the disease.

The personality hypothesis originated in Alexander's observation (1939) that hypertensives appeared to have life-long and largely unconscious conflicts regarding the expression of hostility, aggression, resentment, rage, rebellion, ambition or dependency. Gutman and Benson (1971) reviewed a number of controlled studies that had applied standardized interview techniques and/or personality questionnaires to investigate this issue and concluded that the evidence for a 'hypertensive personality' was limited and that no single personality trait emerges as specific to hypertension. Equally, it was criticized that

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* Sections 2.4.2, 2.4.3 and 3. have been summarized as a separate article (Linden and Feuerstein, 1981), entitled: "Essential Hypertension and Social Coping Behavior" and are published in the Journal of Human Stress, 1981.

the hypothesized 'hypertensive personality' has not been theoretically integrated within the existing knowledge of psychophysiology and blood pressure control. An attempt to integrate the personality and cardiovascular reactivity literature was recently undertaken by Linden and Feuerstein (1981) and major findings are presented in this section. To insure an adequate level of methodological quality, Linden and Feuerstein considered only studies which satisfied the following criteria: N = 10 or more per group; existence of a normotensive control group or use of correlational statistics on a general sample, and/or use of standardized tests that permit replication.

Despite the apparent utility of limiting the literature to the results from standardized evaluations, comparisons were difficult to conduct for a number of reasons. There are actually only four studies incorporating similar measures. Secondly, the choice of control groups and sampling procedures is quite heterogeneous. There are also two different statistical approaches used in the comparison of data; computation of mean score differences and correlations of blood pressure levels with various personality factors. These factors limit conclusions and therefore suggestions must remain speculative.

Many of the significant differences between hypertensives and controls found in one study were not replicated in others. Lewinsohn (1956) reports that neurotic and 'medical problem control' subjects obtained higher scores on the depression subscale of the Minnesota Multiphasic Personality Inventory than groups of patients with hypertension and duodenal ulcers. In contrast, Bulpitt, Hoffbrand and Dollery (1976) report

that hypertensives display elevated scores on depression as measured by the Middlesex Hospital Questionnaire. Friedman and Bennet (1977), investigating a large sample (N = 1101), were unable to replicate this finding with the Zung Depression Scale. A second study using the Minnesota Multiphasic Personality Inventory (Ostfeld and Lebovitz, 1959) also reported no difference in depression between essential hypertensives, renal hypertensives and normotensive controls on the depression subscale.

Neuroticism has also been related to blood pressure. Sainsbury (1964) reported "neurotic tendencies" in hypertensives when compared to controls; however, hypertensives did not differ from a group with psychosomatic disorders and normal blood pressure. Harburg, Julius, McGinn, McLeod and Hoobler (1964) reported a significant correlation between blood pressure and the sensitivity and neuroticism subscales on Cattell's 16 PF. However, in a comparison of 77 matched pairs of hypertensives and normotensives, Ostfeld and Shekelle (1967), using an identical measure, did not observe differences on any subscale.

Despite these inconsistencies, certain characteristics have been reported across several studies. Trait anxiety in hypertensives is one such characteristic. Correlations of resting cardiovascular activity and anxiety scores have been reported. These correlations range from .22 with systolic blood pressure (Harburg et al., 1964) to .66 with peripheral resistance (Pilowski, Spalding and Shawe, 1973).

Attempts have been made to directly investigate hostility as a personality trait (Esler, Julius, Zweifler, Randall, Harburg, Gardiner, and DeQuattro, 1977; Kaplan, Gottschalk, Magliocco, Rohovit and Ross, 1961). Both studies found support for the suppressed hostility hypothesis; however,

Esler et al., (1977) further specified that this finding applied only to a high renin subgroup of hypertensives. A critical response to this study (Kuchel and Genest, 1977), however, points out that Esler et al.'s (1977) findings may be invalid as only half of the high renin hypertensive sample displayed elevated diastolic blood pressure and elevated peripheral resistance, characteristics that are considered essential in classifying an individual as essential hypertensive (cf. Kaplan, 1978).

Expressions of emotion and assertiveness were investigated in several studies. In an early study, Hamilton (1942) compared hyper- and normotensives on a battery of personality tests and found hypertensives to be less assertive and more susceptible to anger. Saslow, Gressel, Shobe, Dubois and Schroeder (1950) compared normotensives with various personality disorders and hypertensives on standardized rating scales. Hypertensives were described as less assertive. A correlation between elevated blood pressure and low assertiveness measured by the 16 PF has been reported by Harburg et al., (1964). Pilowski et al., (1973) also found significant correlations between blood pressure and the deference, abasement and heterosexuality subscale of the Edwards Personality Preference Schedule. Katzenstein, Kriegel and Gaefke (1974) reported a significant assertive deficit in a large sample of hypertensives given a standardized personality test. Self-disclosing behavior has also been evaluated in hyper- and normotensive subjects (Handkins and Munz, 1978). This investigation suggested that hypertensives tend to withhold significantly more information about themselves than normotensives. Finally, a more complex personality pattern of hypertensives has been described by McClelland (1979). Hypertensives were found to

display a higher 'need for power' than 'need for affiliation'. The hypertensives also were characterized by high 'activation inhibition'. This pattern was conceptualized as a disposition toward assertive or angry behavior. As a whole, these studies suggest increased anxiety and consistent difficulties with assertiveness in hypertensives. The possibility of a maladaptive cognitive set was suggested but is only supported by a single study in which the methodology was not well specified (Katzenstein et al, 1974).

2.4.3 Studies of Physiological Reactions to Laboratory Induced Stress in Mild Hypertensives

Lazarus (1978) commented on the failure to develop a coherent body of knowledge regarding the etiology of hypertension and argues that these difficulties may be due to a lack of proper integration of knowledge from three levels of analysis: the social, psychological and physiological. This strategy requires research where interactions of these factors can be observed through multi-level, parallel assessments. Review of the literature indicates the existence of a number of such studies which provide interesting, though preliminary conclusions regarding the interaction of psychological and physiological factors in hypertension.

In the first of two studies, Harris, Sokolow, Carpenter, Freedman and Hunt (1953) exposed 40 pre-hypertensive college women (BP > 140/90 mm Hg, but no established diagnosis of hypertension) and an equal number

of matched controls (BP < 120/80 mm Hg) to emotion provoking role-plays that required assertion. The behavioral responses were recorded and later rated by blind, trained observers using a standardized listing of descriptive adjectives. Pre-hypertensives were less well controlled, more impulsive, egocentric and less adaptable to the stressful situations. The authors concluded that the pre-hypertensives appeared "to bring more anxiety to real-life problem situations, to become more emotionally involved, and to be less effective in achieving their ends". Further, they were likely to create an unfavorable social impression.

The same group of researchers (Kalis, Harris, Sokolow and Carpenter, 1957) extended the above study by adding parallel physiological measurement to the original assessment procedures and compared hypertensives (N = 14, female patients from a hypertensive clinic, average blood pressure 172/102 mm Hg) with normotensive controls (N = 22, working women and students, average BP 119/73 mm Hg). Blood pressure (both dia. and sys) when measured following the stress situations was significantly greater in the hypertensive group (pressure increases average 17 mm Hg, systolic). Behavior ratings of the role-plays indicated a striking congruence with those differences already observed in the previous study with pre-hypertensives. Two conclusions were presented by these researchers. First, the difficulty in emotional control and relations with others appear to be a consistent problem for both the subjects with pre-hypertensive and hypertensive conditions. Secondly, the fact that pre-hypertensives are so strikingly similar in their social deficiencies to

hypertensives strengthens the hypothesis that these characteristics are important in the development and course of essential hypertension.

Schachter (1957) compared hypertensives, pre-hypertensives, and normals on physiological reactivity when induced to laboratory contrived anger, fear, and pain situations. The 18 hypertensives showed significantly greater rises in blood pressure (26 mm Hg, systolic) during pain, fear and anger than the 15 normotensives (14 mm Hg systolic). The variance of blood pressure responses in hypertensives also exceeded that of the normotensives. Hypertensives tended to express psychologically more fear and anger, although these differences were not significant.

In a study by Sapira, Scheib, Moriarty and Shapiro (1971), hypertensives and normotensives saw two films with a patient-doctor interaction, one depicting rude, disinterested behavior on the part of the physician, and the other showing a relaxed and warm atmosphere. While viewing the film, parallel physiological responses were recorded. The physiological measures indicated that blood pressure and heart rate were higher (heart rate approximately +2 beats per minute, blood pressure +2 mm Hg) for the hypertensives than for the normotensive controls during the film presentations. Following the film, subjects engaged in a conversation with the experimenter to assess attitudes regarding the film while physiological measurement was continued throughout the conversation. This experimental condition indicated similar differences between the groups. It even appeared that the interview

situation with an experimenter who had role-played the "bad" doctor before led to significantly higher blood pressure (20.1 mm Hg for hypertensives vs. 9.7 mm Hg for normotensives), when compared to the responses while viewing the film.

The authors found most striking that the hypertensive group tended to not report any differences between the two types of doctors depicted in the film, while the normotensives clearly identified behavioral differences of the "good" and the "bad" physician. It was concluded that these data support the hypothesis that hypertensives tend to screen out potentially noxious stimuli and that this constitutes a behavioral response to their hyperreactive pressor system.

The potential importance of personal interaction as a source of psychological stress was also investigated by Williams, Kimball and Williard (1972) who measured the blood pressure of 17 hypertensive subjects in interview situations where the content of the interview and the amount of interpersonal interaction were systematically varied. Significantly higher diastolic blood pressure was observed (approximately + 8 mm Hg) when the interaction was more interpersonal compared to a limited contact interaction. Content appeared not to have significant influences.

What can be concluded from the stress induction experiments? Stressors of varying types (experimental induction of anger, fear, pain; observation of film material with an emotion-provoking content; stressful

role-play; hypnotic inductions, etc.,) have been presented and result in consistent physiological arousal (heart rate and/or systolic/diastolic blood pressure, peripheral resistance) compared to a baseline. In addition, hypertensives displayed greater magnitude and more variance in their bodily responses.

On the basis of the studies reviewed, no stressor emerges as more powerful than another; the only exception to this conclusion may be seen in the repeated observation (Sapira et al., 1971; Williams et al., 1972) that hypertensives are especially arousable in situations that include direct social interactions; i.e., they react less strongly when no interpersonal response is required.

Some limitations in making strong conclusions from this type of study may result from the nature of the stressors used. Typically the stress induction is executed in a standardized manner, assuming that these stressors will lead consistently to stress responses in the subjects. Thus no consideration is given to the possibility that stressors may have very different impacts on subjects, depending upon their individual life experiences, their behavioral and cognitive coping strategies, and the differential frequency of occurrence of these stimuli in their natural environments (Roskies and Lazarus, 1980). In the typical stress induction procedures a standardized analogue of real-life stress is provided without validational confirmation indicating the amount of blood pressure variability accounted for by these stress analogues. In short, as long as it is unclear how individually relevant such a stressor is, the potential value for explaining the role of any

stress stimulus in the etiology of hypertension remains in question.

2.4.4 Blood Pressure Reactivity in Naturalistic Settings Using Ambulatory Measurement

One approach to the observation of psychological and physiological responses to real-life events is through the use of ambulatory blood pressure measurement. Physiological reactivity can then be observed in everyday situations while the subject can simultaneously record his behavioral and emotional reactions specific to the realistic events. Piloting work with a portable blood pressure recorder (Hinman, Engel and Bickford, 1962) indicated that such ambulatory measurement can be executed with sufficient accuracy to determine intradaily variations in the levels of pressure.

A similar portable blood pressure monitor was used by Sokolow, Werdegar, Perloff, Cowan and Brenenstuhl (1970) in which the relation of daily life events and blood pressure was investigated in a hypertensive population ($N = 50$). Subjects recorded their blood pressure every half hour for two days , and kept a diary of events as well as brief adjective check lists. The check lists contained scales rating mental alertness, anxiety, depression, hostility, time pressure and well-being. Analyses of the data revealed that blood pressure varied considerably during the day. The authors report an average variability of 60 mm Hg systolic and 32 mm Hg diastolic blood pressure during different activities within one day. Information on the types of activities that accompany the highest and lowest blood pressure levels respectively

was given for one subject for illustrative purposes. This patient, a female graduate student, showed her lowest pressure level of 100 mm Hg while at home, relaxed and talking to her son; in contrast the highest level, about 160 mm Hg, was present twice, at lunch hour anticipating an academic course and in the evening going to school again, being rushed and fatigued, tense and worried.

The five highest daily blood pressure levels (systolic and diastolic) were associated with significantly higher scores on scales for anxiety, time pressure and alertness. Hostility and depression scales did not discriminate between high and low blood pressure levels.

Negative correlations of self-report and blood pressure were significant for feelings of contentment and positive affect, while positive correlations were observed between blood pressure and anxiety, time pressure, alertness and negative affect. Severity of hyeprtension was equally related to self-reported intensity of emotions.

A similar approach was reported by Whitehead, Blackwell, DeSilva, and Robinson (1977). Subjects monitored their blood pressure four times daily for a seven week period and rated the simultaneous experiences of anger and anxiety on simple analogue scales. Anger and anxiety were found to correlate significantly with blood pressure (r's ranged from .21 for hostile attitude/diastolic to .32 / systolic blood pressure; state anxiety correlated with $\underline{r}$ = .24 and .25, respectively).

Unfortunately, both studies used psychological measures which were unique to each study. Reliability or validity of these measures in unknown. Consequently, it ;s impossible to compare these results with

normative scales of anxiety, depression, anger, etc., that were used in the personality research described above.

Peiss (1967) presents confirmation of the extreme variability of blood pressure during different daily activities. Essential hypertensives, renal hypertensives and normotensives were observed during their regular daily activities. The largest variation observed in this sample was 90 mm Hg systolic (ranging from 170 - 240 mm Hg during the day, with a further drop to 150 mm Hg while asleep). The ranges of variability (between lowest and maximum pressure levels within one day) were:

- normotensives (N = 8) 18 - 44 mm Hg, mean = 29 mm Hg for the group;
- essential hypertensives (N = 22) 22 - 128 mm Hg, mean = 52 mm Hg for the group;
- renal hypertensives (N = 8) 22 - 48 mm Hg, mean = 34 mm Hg for the group.

Variations in diastolic pressure were reported to be of smaller magnitude but of the same pattern. Hypertensives do not only display the higher base-line blood pressures but also show considerably more lability than the renal hypertensives or normotensives.

Two findings from these studies should be emphasized. Variability in blood pressure during daily activities was found considerably higher than those increases observed during laboratory induced stress raising questions regarding the validity of analogue-type lab stressors in research on hypertensive etiology. Secondly, self-report of various

emotions appear to be significantly correlated with measured pressor response, with anxiety, anger/hostility and time-pressure cited as the most frequent correlates of high blood pressure.

2.5 Conclusions

On the basis of the above review of psychophysiological factors in hypertension, certain general conclusions appear justified:

1. Hypertensives not only possess elevated baseline blood pressures but also show a greater lability in pressor response than normotensives.
2. Different types of lab stressors lead to quite similar physiological responses, both in direction and magnitude.
3. The only exception to this observation on equipotentiality in lab-type stressors seems to be the intensity of interpersonal behaviors, pointing toward stronger reactions of hypertensives in more direct, involving, social contacts.
4. Lab-induced stress results in significant pressor change ranging between 2 - 26 mm Hg systolic blood pressure (average over six studies 14 mm Hg). Naturally occurring stressors, however, appear to elicit cardiovascular responses averaging twice as much blood pressure change than did the most effective lab stress. This discrepancy highlights the unresolved question of validity in laboratory stress experiments.

The major observations regarding etiology, epidemiology and treatment of hypertension can now be summarized. Traditional risk factors can explain only a minor proportion (20 - 30% of the variance in baseline blood

pressure Multivariate statistical analyses indicate that--in contrast to previous belief--some of these factors have negligible predictive value (smoking, exercise, cholesterol). Epidemiological studies seem to contribute very little to the understanding of stress and cardiovascular reactivity.

Research on personality patterns in hypertension has produced a plethora of traits which supposedly differentiate hypertensives from normotensives. While many of these results could not be replicated, a certain pattern in behavior was found describing hypertensives as anxious, passive-unassertive or angry/hostile. The emergent hypothesis from this type of research associates a lack of social coping skills with essential hypertension.

Stress induction in the laboratory is clearly related to changes in blood pressure. The hypothesis of a response specificity within the individual can be generally supported; stimulus specificity, however, is lacking. Blood pressure lability due to lab stress can explain only limited proportions of the lability that is found in naturalistic environments. The present methodology in lab-type research appears insufficient to allow a controlled analysis of blood pressure variability under varying and natural stimulus conditions.

3.0 Toward an Integrated Model

The literature on social competence and essential hypertension suggests that hypertensives differ from normotensives at all three levels

of observation (behavioral, cognitive and physiological) used to conceptualize social competence. The behavioral response style that appears to characterize hypertensives corresponds closely with patterns observed in individuals with low social competence (Rich and Schroeder, 1976). The social competence and essential hypertension literature is highlighted below with the purpose of formulating an integrated model of social functioning in hypertensives, which describes the potential influence of ineffective social coping on the maintenance of elevated blood pressure.

As indicated in Table 1, there appears to be a number of similarities between the psychological factors in hypertension and those variables that identify a socially anxious and/or unskilled individual. The hypothesis emerges that social competence may act as a mediating factor in essential hypertension.

It is intuitively logical that an individual is more anxious in anticipation of difficult interpersonal situations when this anticipation is associated with a perception that he will not perform well. Whether this perception is based on an unjustified interpretation of anticipated difficulty or on the knowledge and/or experience that one has no means of coping effectively with the situation, is not crucial from a physiological perspective. Both conditions are in themselves sufficient to elevate blood pressure and generate the physiological component of the stress response (increased sympathetic nervous system activation). If a stress response is viewed as a nonspecific reaction, it then becomes

Table 1

Social Coping Style in Hypertensives and Individuals with Social Skills Deficits

BEHAVIORAL	Less skilled in interpersonal stressful situations (Harris et al., 1953; Kalis et al, 1957).	Difficulty emitting adaptive social behaviors (Eisler et al., 1975; Schwartz and Gottman, 1976).
COGNITIVE	Tendency toward negative cognitive set (Katzenstein et al., 1974; Weiner et al., 1962).	Socially anxious subjects report greater negative self-perceptions (Smith and Sarason, 1975; Watson and Freund, 1969) and situational evaluations (Schwartz and Gottman, 1976).
PHYSIOLOGICAL	Autonomic reactivity tends to increase with degree of personal involvement in social interaction (Sapira et al., 1971; Williams et al., 1972).	Tonic levels do not differ between socially anxious and non-anxious subjects; however, anticipatory response and response during difficult social interactions is greater in the socially anxious individual (Borkovec et al., 1974; Kanfer and Goldfried, 1978; Twentyman and McFall, 1975; Weerts and Lang, 1978).

apparent how the cognitive and behavioral aspects of social anxiety and skill deficit may contribute to excessively frequent physiological arousal and therefore to unnecessarily prolonged elevations of cardiovascular activity. Unjustified anticipation of difficulty may evoke arousal responses (anticipatory anxiety) more often and negative cognitive evaluations of situational performance may maintain the perception that the interpersonal difficulty is not satisfactorily dealt with. Both these conditions can maintain a state of elevated blood pressure. If this cognitive deficit is also accompanied by a skill deficit (i.e., an ability to generate effective interpersonal behaviors), a sufficient solution may be delayed or completely prevented. With the perception of a maintained conflict blood pressure can be expected to remain significantly elevated. Animal research (McCubbin et al., 1956; Sleight et al., 1975) has provided evidence that following continuous stress the baroreceptors, in their function as blood pressure regulators, tend to reset at a higher level, thus maintaining an elevated blood pressure level. While this has not been demonstrated in humans, a similar mechanism may operate.

Equally, a lack of skill alone may prevent the solution of an interactional problem, or may aggravate the situation, necessitating maintained or even greater physiological arousal. The original flight/attack character of the stress response can be related to social competence. While the human body continues to respond in the dichotomous reaction of flight/avoidance or attack/aggression, discrimination and skill is

needed to deal with interpersonal problems in a mutually satisfying way. In this context, the two response types, 'flight' or 'attack', also form the opposing end of the social competence continuum and differ from acceptable assertion (Lange and Jakubowski, 1976). Further, anger and anxiety (which are frequent correlates of attack and flight, respectively) tend not to differ at a gross physiological level (Schachter, 1957). Both response dimensions tend to be associated with increased cardiovascular activity or general activation.

Empirical validation of the proposed theory would necessitate further investigation of physiological reactivity to interpersonal stress. These studies, however, will be difficult to undertake because of the well established observation that individual relevance of social stimuli is an essential determinant of the behavioral response (Bellack et al., 1979). A methodology which integrates a normative (i.e., permitting interindividual comparisons) and ipsative (i.e., reflecting identified individual specificity) approach would be most useful. Efforts toward the development and validation of such an ipsative-normative assessment procedure have been undertaken (Linden and Feuerstein, note 3) and may enhance further progress in the study of social functioning in hypertension.

If the social competence model--as specified above--is descriptive of the hypertensive's general social response style, it remains to be determined whether the deficit in 'social competence' existed prior to the onset of hypertension or concomitant with the disorder.

As previously indicated, suggestive evidence is available that a

specific psychological pattern may precede the development of essential hypertension (Harris, et al., 1953; Kalis, et al., 1957). The possibility that a specific 'personality type' may have predictive value for the development of hypertension is supported in longitudinal research (McClelland, 1979). Individuals high in 'need for power' and 'need for affiliation' were found to have elevated blood pressures and also to show signs of hypertensive pathology 20 years following the initial measurements.

Regardless of the validity of the predisposition argument, it must be emphasized that the proposed social competence model is directed at the role social competence may play in the maintenance of elevated blood pressure. If the hypertensive is socially deficient, then interpersonal distress could require repeated behavioral and physiological adjustments which--if not etiologic--may maintain the problem. Therefore research on the role of social competence in hypertension can provide data with both theoretical and clinical significance.

The following investigation was designed to evaluate the proposed social competence model under individually relevant, yet standardized, stimulus conditions. The investigation comprises two studies. The first study was executed to establish a data base for the selection of interpersonal distress stimuli that would permit an ipsative (i.e., incorporating some degree of subjective identification with the stimulus situation) and yet simultaneously normative (i.e., permitting comparisons across individual subjects) approach to response measurement in interpersonal distress situations. In the second study, hypertensives and normotensives were compared with regard to their response pattern in interpersonal distress situations.

It was predicted that hypertensives would (1) display a blood pressure hyperresponse, (2) report more anxiety, and (3) display less social skill than normal blood pressure controls. The hypothesis of a negative cognitive set in hypertensives during role-enactments of interpersonal distress situations was also explored.

STUDY I*

4.0 Method

4.1 Subjects

Ninety-four adult males volunteered to participate; thirteen subjects, however, did not return the test material or provided incomplete responses that prevented their inclusion in the sample. The final sample consisted of 81 adult males with an average age of 41.5 years (SD = 11.8) ranging from 20 to 63. All subjects were married or reported a relationship with a steady partner. While the sample included subjects at all socio-economic levels, an analysis of occupation indicated that the sample included a greater proportion of higher income groups and educational levels. Psychological characteristics of all subjects (i.e., anxiety and cognitive functioning) were assessed to assist in determining the representativeness of the sample.

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* Portions of the results were presented at the 14th Annual Meeting of the AABT, New York, November 1980 (Linden and Feuerstein, Note 3).

4.2 Procedure

4.2.1 Assessment of anxiety and cognitive functioning

All subjects completed the Spielberger Trait Anxiety Inventory - Trait Form (STAI) (Spielberger, Gorsuch, and Lushene, 1970), the Social Anxiety and Distress Scale (SAD)(Watson and Friend, 1969) which is a questionnaire on social anxiety and avoidance behaviors, and the short form of the Intra--personelle Kommunikation Inventory (IPK) which was translated from the original German version (Quitmann, Tausch, and Tausch, 1974). The IPK contains 38 items and evaluates the frequency of positive and negative self-verbalizations individuals use to describe and evaluate themselves and their actions.*

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* Validational data for large samples of adolescents and adults based on the original questionnaire indicate that the frequency of negative self-communications correlates with neuroticism (r = .39), trait anxiety (r = .34), and emotionality (r = .24) in adolescents (Quitmann, et al., 1974). An adult sample of psychiatric patients was differentiated from normals and somatically ill patients on the basis of their self-verbalization. The frequency of negative self-communications as measured by the IPK correlated with neuroticism (r = .46) (Boellner, Tausch and Tausch, 1975).

4.2.2 Development of a set of interpersonal distress stimuli

In order to obtain data on interpersonal distress situations that would have a normative character and which could also be utilized to permit an ipsative approach, a set of distress situation descriptions was derived that encompassed a variety of realistic interpersonal interactions while maintaining some comparability with each other. Interpersonal social interactions are known to vary on a number of parameters which may also influence the potential responses. Prior research has indicated that the quality of an interpersonal behavior is largely dependent on familiarity and affective involvement with others (Eisler, et al., 1973, 1975; Zeichner, et al., 1977). Rich and Schroeder (1976) have further suggested that social interactions typically aim at a reinforcement gain, but if performed unskillfully may lead to a reinforcement loss. This issue becomes particularly meaningful in dependent relationships as between family members or between employee and supervisor.

It was therefore decided to classify interpersonal distress interactions into four relationship categories which are characterized by distinctive patterns of familiarity, affective involvement and dependency on others. The categories thus established described interactions with either: spouse and direct family members (SF); friends, neighbors, and acquaintances (FA); peers, supervisors at work (WO); or strangers in stores, public transportation, cafeterias, government or other administrative functions (ST). In order to ascertain the comparable impact of different interpersonal situations so that low and high distress conditions for a

role-play assessment could be established, situations were also to be evaluated for their interpersonal distress properties as perceived by each individual.

An item pool of 20 interpersonal situation descriptions (five for each of the established relationship categories) was selected from a list of 108 exercises for assertion training (Ullrich-DeMuynck and Ullrich, Note 2). The situations were to meet the following criteria: 1) ease of transforming situation descriptions into role-play components of comparable length (2-3 minutes); 2) representative of positive and negative assertion; 3) interactions with a variety of social partners; 4) exclusion of overly specific situation descriptions that would apply to only very limited population groups (e.g., psychiatric inpatients or college students); and 5) reflection of subjectively different levels of distress while coping with the situation. The 20 situation descriptions thus generated were pretested on a small sample of convenience ($\underline{N}$ = 10), adults ranging from 24-48 years, half were male, half were female) to determine concordance of judgment in rank-ordering to perceived distress experienced in these hypothetical situations. The set is presented in Appendix A.

4.2.3 Evaluation of the set of interpersonal distress situations

Each situation was described on a separate index card and labelled with a code (SF, FA, WO, or ST) for type of relationship and lettered A to E for identification (letters A to E were assigned at random and did not reflect

an order of perceived distress). Subjects were instructed to rank-order the five situations in a single category according to the perceived degree of distress. In a second step, subjects assigned a total distress score based on a scale from 1 to 200 (indicating maximum distress) for each of the five situations. This procedure was then repeated in a random order for the remaining three categories. In order to anchor the scale, an arbitrary value of 100 was assigned to the following example:

> You are married or living with someone, and you meet someone else and fall in love with this person. You now have to tell your spouse/ partner that you want to move out and separate for a 3-month trial period. Your spouse is very hurt.

This approach was based upon the procedure of Holmes and Rahe (1967). The arbitrary score of 100 described the scene proposed as most distressing by the investigator. This scene was not considered a frequent interpersonal situation. It was therefore expected that a more frequent, highly distressing interpersonal situation would receive an average score significantly lower than '100'. To permit individual variation, however, the scale was extended from '1' to '200'. Subjects were also requested to rate how realistic each situation was considered to be using a 1 to 5 (1 = not realistic to 5 = very realistic) Likert scale. This evaluation procedure was termed 'Rating of Social Situations' (ROSS). A test-retest reliability determination for the rating procedure was also performed. Ten subjects chosen at random were readministered the ROSS one week following the original testing.

5.0 Results

Data on demographic and psychological variables indicate that the sample scored in the normal range with regard to social and trait anxiety as well as positive and negative self-verbalizations. Mean scores are depicted in Table 2.

The eighty-one subjects indicated that the 20 interpersonal distress situations were perceived as realistic. Means and standard deviations for this rating are shown in Table 3.

Test-retest reliability coefficients for distress scores assigned to the five situations in each category were computed. The coefficients obtained are as follows: spouse/family, $r = .81$; work, $r = .82$; friends/acquaintances, $r = .91$; and strangers, $r = .71$.

Data from the 'Rating of Social Situations' procedure were analyzed for significant differences in the rank orders and in the distress scores for each of the 20 situations. Mean ranks for perceived distress of the five situations per category were computed and are shown in Table 4. Rank differences were computed by means of a Friedman-test (Winer, 1971) and the resulting chi-square values were: $x^2_r = 827$, $p < .001$ for the SF category; $x^2_r = 980$, $p < .001$ for WO; $x^2_r = 928$, $p < .001$ for FA; and $x^2_r = 1239$, $p < .001$ for ST. This analysis indicates that the rankings in each category were significantly different.

Significance tests on perceived distress for each situation were computed using an omnibus F-test (Winer, 1971). The respective F-values were $F(1,80) = 13.02$, $p < .001$ for the SF category; $F(1,80) = 42.6$, $p < .001$ for

Table 2

Means and Standard Deviations for Age, Social Anxiety, Trait Anxiety, and Cognitive Style

Measure	Mean	SD
Age	41.5	11.8
Social Anxiety and Distress	6.7	5.8
State-Trait Anxiety Inventory-Trait	36.5	9.3
Positive Self-Verbalization	14.9	3.9
Negative Self-Verbalization	5.5	3.9

Table 3

Ratings of Perceived Degree of Reality[a]

Relationship Category	Specific Situation				
	A	B	C	D	E
SPOUSE/FAMILY	3.2 (1.2)	3.2 (1.4)	3.5 (1.1)	3.3 (1.3)	3.2 (1.1)
WORK	3.7 (1.1)	3.1 (1.2)	4.2 (0.9)	3.3 (1.2)	4.1 (1.7)
FRIENDS/ACQUAINTANCES	3.9 (1.0)	3.3 (1.3)	3.7 (1.2)	3.9 (1.2)	3.3 (1.3)
STRANGERS	3.3 (1.8)	3.8 (1.0)	3.8 (1.1)	4.1 (1.2)	3.5 (1.2)

n 81

Standard deviations in parentheses

[a]Based upon 1-5 scale, 1 = not realistic at all to 5 = very realistic

Table 4

Mean Ranks assigned to the ROSS situations

Relationship Category	Perceived Distress Order				
	1	2	3	4	5
SPOUSE/FAMILY					
Mean score	2.0	2.9	3.0	3.2	3.9
Specific Situation	D	E	B	A	C
WORK					
Mean score	1.4	2.2	3.4	3.9	4.0
Specific situation	E	C	D	A	B
FRIENDS/ACQUAINTANCES					
Mean score	1.4	2.4	3.1	3.9	4.1
Specific situation	D	A	C	E	B
STRANGERS					
Mean score	1.4	2.7	3.8	3.9	4.1
Specific situation	D	B	E	C	A

WO; $F(1,80) = 48.6$, $p < .001$ for FA; and $F(1,80) = 30.3$, $p < .001$ for the ST category. Post-hoc comparisons using Scheffé's method ($p < .05$) indicated that an increase in three ranks was equivalent to a significant difference in interval scores. This applied to 11 of the 12 possible comparisons. In some categories a rank difference of two was sufficient to significantly discriminate between the situations. Perceived distress scores for each situation were computed and are shown in Table 5.

6.0 Discussion

The results of the present study indicate that a number of interpersonal situation descriptions exist in which situations across four distinct types of relationship are comparable along the dimension of subjective distress experienced in hypothetical interactions. Those situations evaluated as least and most distressing received distress scores that encompassed an equivalent range for each of the four relationship categories. Situations involving various types of relationships appear exchangeable with regard to their distress properties.

Test-retest reliability and the discrimination between successive levels of distress indicated that the ROSS possesses acceptable psychometric properties. The sample on which the test-retest reliability was evaluated was relatively small and the reliability coefficients derived should therefore be considered tentative.

The generality of findings in any study - particularly one establishing a normative data base - depends largely on the size and representativeness of the sample investigated. The sample described in the present study appears

Table 5

Mean Distress Scores for the ROSS situations

Relationship Category	Perceived Distress Order				
	1	2	3	4	5
SPOUSE/FAMILY					
Mean score	19.4	34.8	43.9	39.8	52.8
Specific situation	D	E	B	A	C
WORK					
Mean score	14.5	22.8	46.6	55.9	58.7
Specific situation	E	C	D	A	B
FRIENDS/ACQUAINTANCES					
Means score	14.0	28.6	46.8	64.4	68.6
Specific situation	D	A	C	E	B
STRANGERS					
Mean score	13.9	32.6	56.5	43.7	54.2
Specific situation	D	B	E	C	A

to represent a major segment of a non-disturbed adult male population.

Numerous steps are conceivable as to the validation of this data set. Internal validity may be determined through the addition of self-report measures of anxiety, anger, frustration prior to or immediately following the enactment of role descriptions provided in the ROSS. Validation may also be achieved using psychophysiological measurement during the role-play interactions. It is hypothesized that the more 'distressing' situations will result in the greatest elevations in physiological indices of arousal. External validity of the normative data set might be determined by its predictive value of future performance in the same or a comparable social situation.

It is further conceivable to compute an overall ROSS score by averaging the 20 scores which an individual had assigned to the set of situation descriptions. In line with prior research (Schwartz and Gottman, 1976) it is expected that high socially anxious individuals will also assign elevated scores to the ROSS situations. This suggestion, however, requires validation.

STUDY II

7.0 Method

7.1 Subjects: Recruitment and Screening

Subjects were recruited from a local family practice center which also serves as a teaching facility for residents in family medicine, and through newspaper, local radio and television announcements. The benefits of participation were described as individual feedback on stress responses and post-experimental training in progressive muscle relaxation.

Subjects were adult males between 30 and 60 years and were not to report stress related disorders (i.e., ulcers, chronic pain, migraine headaches, asthma). A rigorous blood pressure criterion was established by averaging five intermittent readings following a 5-minute adaptation. Individuals with a blood pressure above 140 mm Hg systolic and above 90 mm Hg diastolic were considered untreated hypertensive, individuals with blood pressure lower than 140 mm Hg systolic and below 90 mm Hg diastolic were considered normal blood pressure controls. Individuals were categorized treated hypertensive when they were presently taking anti-hypertensive medication. The blood pressure criterion was not applied for this sample.

A screening of approximately 5,000 medical files in the family practice center resulted in a listing of 64 cases which met the criteria. These potential subjects were contacted via telephone by a collaborating physician from the center. Upon agreement, subjects were invited to an information and testing session. Fifteen (23%) of the contacted family practice patients initially agreed to participate; five, however, missed repeated appointments, and another five revealed blood pressures below

140/90 mm Hg, although diagnosed 'hypertensive' by their family physician.

Volunteers responded to the public announcements by telephone. Thirty-three of 59 respondents met the criteria for membership in one of the experimental groups and completed the study. Family physicians were contacted for verification of the diagnosis 'Essential Hypertension'.

The final sample consisted of 38 adult males with $N = 20$ in the normal blood pressure control group, and the remaining 18 subjects equally distributed in treated and untreated hypertensives. Three hypertensives were presently taking a diuretic, two were treated with beta-blockers, and the other four subjects were using a combination of diuretic and beta-blocker. The sample characteristics are shown in Table 6.

7.2 Procedure

The study incorporated three distinct experimental phases.

7.2.1 Phase I

Subjects were briefed on the experimental procedures, provided data on age, height, and education, and completed the Social Anxiety and Distress Scale (SAD) (Watson and Friend, 1969), a questionnaire on social anxiety and avoidance behaviors; Spielberger Trait Anxiety Inventory-Trait Form (STAI) (Spielberger, et al., 1970); Intrapersonelle Kommunikation Inventory (IPK), a questionnaire on cognitive coping style (described in more detail by Linden and Feuerstein, Note 3); Beck

Table 6

Sample Characteristics

	Groups					
	Untreated Hypertensive (N = 9)		Treated Hypertensive (N = 9)		Normal Blood Pressure (N = 20)	
	M	(SD)	M	(SD)	M	(SD)
Age	41.44	(9.03)	51.89	(6.13)	42.45	(9.17)
Weight (kg)	80.78	(11.41)	73.56	(9.13)	74.45	(10.91)
Education	14.44	(3.05)	13.11	(3.76)	14.55	(3.62)
SBP-BL[a]	150.56	(15.91)	138.56	(12.26)	130.20	(6.86)
DBP-BL[b]	95.00	(6.46)	83.00	(11.49)	75.20	(9.28)
HR-BL[c]	73.89	(7.94)	71.33	(14.14)	73.15	(10.23)

[a] Systolic Blood Pressure, Baseline

[b] Diastolic Blood Pressure, Baseline

[c] Heart-Rate, Baseline

Depression Inventory (BDI) (Beck, 1978); an overall score for the Rating of Social Situations (ROSS) (Linden and Feuerstein, Note 3), an index of perceived distress in social situations; and the Social Desirability Scale (SDS), which was used to measure "affect inhibition" and "repressive defensiveness" (Crowne and Marlowe, 1964; Wiesenthal, 1974, p. 39). In addition, subjects completed a consent form and received instructions for self-monitoring (Phase II).

7.2.2 Phase II

For two weeks, participants monitored the frequency and perceived level of distress experienced in unpleasant social interactins. A small printed diary containing detailed instructions was provided for the recording. The diary included one page per day and contained separate rows for each of the four relationship categories 'Spouse/Family', 'Work', 'Friends/Acquaintances' and 'Strangers'. A coding system based on a Likert scale (1 - 9, 1 = minimum, 9 = maximum distress) was utilized to reduce recording time. The diary is contained in Appendix C. The role-play test (Phase III) was arranged within one week following the end of the self-monitoring period.

7.2.3 Selection of Individually Relevant Yet Standardized Role-Play Stimuli for Phase II

Information gathered during the self-monitoring period was incorporated in the role-play test. The role-play test consisted of two role-play interactions in the low, and two in the high distress cate-

gories. The self-monitoring diary provided the information necessary to select individually relevant low and high distress role-play stimuli. For each interaction category (Spouse/Family, Work, Friends/Acquaintances, Strangers), an overall distress score was determined by multiplying the number of experienced stressful interactions with the average level of distress reported for these interactions. This computation resulted in four distress scores allowing the relationship categories to be arranged in order from lowest to highest distress experienced. Individually relevant low distress was then determined by selecting social interactions for role-play from the category in which the least distress had been reported. Individually relevant high distress was equivalently determined by selecting role-play interactions from the category in which the most distress had been reported.

In order to maintain a standardization of role-play stimuli, situation descriptions for the role-play test were selected from the set of social situations for which normative distress evaluations had been obtained (Linden and Feuerstein, Note 3). This normative data set permits the selection of five different social interaction descriptions for role-play in four distinct relationship categories (spouse/family, work, friends/acquaintances, strangers) such that situations in different categories incorporate distress properties comparable with each other. Individual relevance and standardized stimulus presentation were finally integrated by defining low distress as enacting those two social interaction descriptions perceived least distressing by the normative sample within the relationship category in which the least distress had been

reported by individual subjects during self-monitoring. Similarly, high distress was defined as enacting those two social interaction descriptions perceived most distressing by the normative sample within the relationship category in which the most distress had been reported by individual subjects during self-monitoring.

7.2.4 Phase III

Pilot work with 20 college students provided information for design details of the role-play test. The assessment procedure was approximately 50 minutes long and consisted of: (1) an explanation of the procedure; (2) a 1-minute trial role-play based on situation, 'Friends/Acquaintances-C' (cf. Appendix A) in order to familiarize the subject with the role-play procedure; (3) a 10-minute adaptation period; (4) two consecutive role-play interactions of 1.5 minutes each; (5) a recovery period of a minimum of 5 minutes. If blood pressure had not fully recovered within five minutes (i.e., systolic blood pressure $\geq \pm$ 10 mm Hg, and diastolic blood pressure $\geq \pm$ 5 mm Hg different from pre-test values) recovery was extended until comparable pre-test levels were obtained; (6) two consecutive role-play interactions of 1.5 minutes each; and (7) a 5 minute recovery period. The order of the low and high distress conditions was counterbalanced in order to control for serial effects.

Immediately following the role-play-test, subjects were asked to rate on a 1 - 10 scale (low to high) how distressing and how realistic they found each of the role-play situations.

A Grass Instruments Model 7 Polygraph with a Grass Photoelectric Transmittance Plethysmograph (Model PTTL-1), positioned on the right earlobe was used to record heart rate. Systemic arterial pressure (systolic and diastolic) was recorded at 1-minute intervals using a Dinamap Model 850 automatic sphygmomanometer. Heart-rate and blood pressure were measured during adaptation, recovery, prior to and immediately following each role-play interaction. The delay in post role-play measurement amounted to approximately 10-15 seconds. During adaptation and recovery, the subject was sitting quietly in a comfortable armchair.

Blood pressure data were computed by (1) averaging the two readings from adaptation minutes 9 and 10 to form pre-test baselines, (2) averaging the blood pressure readings taken immediately after each of the two role-play interactions in low and high distress, and (3) by averaging the last two readings of the 5-minute recovery period. Thus, one systolic and one diastolic pressure value were obtained for six measurement phases (i.e., baseline-low distress-recovery; baseline-high distress-recovery). Heart-rate (beats per minute) was determined by doubling the values obtained (1) during thirty seconds of continuous recording in minute 10 of the adaptation period, (2) immediately following each role-play, and (3) during minute 5 of the recovery period. Recordings taken after the two role-play interactions in low and high distress were averaged to form one heart-rate value for the low, and one value for the high distress condition.

In the role-play situations, subjects interacted with one of four

trained role-players. The role-players, two male and two female, were graduate students (age 23). Role-players had received thirty hours of training through instruction, role-rehearsal and pilot work and responded in a standardized manner. Role-players were friendly and cooperative in low distress, reticent, uncooperative, and annoying in high distress conditions. A script containing a selection of appropriate responses was utilized by the role-players. They were instructed to personalize the interactions by using realistic names from the subject's natural environment, and by adjusting the role-play content to the subject's naturalistic living and working conditions. The experimental subjects' role-play performance was recorded on audiotape and later rated by trained observers who were blind to the treatment conditions. The observers had received six hours of training via model tapes; training was terminated when the interrater reliability of judgment had reached $\underline{r} = .80$.

7.3 Rating System for Evaluating Social Skill

Shepherd's (1977) Rating of Behavior in Social Situations (RBSS) was chosen because of its demonstrated reliability and item validity. The rating system contained 12 scales with behavior descriptions that are rated for occurrence or non-occurrence on a 1 - 5 scale each, and are summated to form a single composite score. The composite score helps to reduce data as only one score for overall, overt behavioral skill is given. This score is based on distinguishable behaviors that

were found to be valid predictors of social skill (Conger, et al, 1980; Eisler, et al, 1973, 1975; Fischetti, et al, 1977). These behaviors are: eye-contact, facial expression, gestures, response delay, tone of voice, attentiveness, self-disclosure, timing, initiation of conversations, breadth of topics in repertoire, assertive argumentation, length of verbal response, inappropriate introversion, standing up for one's rights, and flow of speech (the rating form is contained in Appendix D).

In this system, emphasis is placed upon content of speech (half of the above items), a factor that Conger, et al (Note 1) found to be more indicative of skill than nonverbal behaviors. Many other rating systems (cf. Hersen, Bellack and Lamparski, 1979) pay only minimal attention to these content variables. Lastly, the system requires minimal rater training and has been shown to have adequate inter-rater reliabilities (r = .65 to .95, Shepherd, 1978; r = .76 to .79, Linden and Wright, 1980). Test re-test correlations of rating scores over a 6-week period were r = .82 (Shepherd, 1978).

Social skill during the role-play test was evaluated by a pair of trained observers who were blind as to group membership. Interrater reliability coefficients were computed according to Kent and Forster (1976). Ratings were executed separately for role-plays in low and high distress and interrater reliability was found to be r = .74, and r = .79, respectively. Given that the separate evaluations resulted in essentially equal findings, only an overall social skill score is reported. The concordance of judgment between raters for the overall skill score was r = .80.

Role-player behavior was judged by a pair of blind, trained observers according to the audiotaped interaction. Using a 1 - 9 Likert scale (1 indicating a friendly, cooperative behavior and 9 indicating unfriendly, uncooperative behaviors), the role-player behavior in each situation was evaluated. Interrater concordance of judgment calculated with the Kent and Forster (1976) formula was found to be $\underline{r} = .64$. Data were reduced by averaging the two scores within each distress category.

8.0 Results

Data analyses were executed separately for six groups of questions addressed in the present study: (1) comparisons of physical and biographic sample characteristics and interpersonal stress-related personality aspects as assessed in Phase I (i.e., age, weight, education, social and trait anxiety, depression, self-verbalizations, social situation evaluations, and defensiveness); (2) group comparisons of self-monitoring of interpersonal distress (Phase II); (3) analyses of role-play situation characteristics and evaluation of overt behavior in the role-play test (Phase III); (4) situational analysis of blood pressure and heart-rate responses during the role-play test (Phase III); (5) empirical validation of the low and high distress role-play procedure; (6) intercorrelations of experimental variables and the prediction of hypertension.

8.1 Biographical and Psychological Characteristics

One-way analyses of variance and post-hoc tests (Newman-Keuls, $\underline{p} < .05$)

were executed to determine group differences on biographical variables (age, weight, education) and psychological characteristics (social and trait anxiety, depression, cognitive style, defensiveness, and social situation evaluations). While no group differences were observed for weight and education, group differences were found on age. Untreated hypertensives did not differ from controls (q = 0.39, df 2,35, ns) but both groups were younger than the medicated hypertensives (q = 4.06, df 2,35, $p < .01$, and q = 3.67, df 2,35, $p < .05$, respectively). The untreated hypertensives had considerably higher systolic blood pressure than the treated hypertensives (q = 3.67, df 2,35, $p < .05$) and the normal blood pressure controls (q = 6.23, df 2,35, $p < .01$). The treated hypertensives, however, did not have significantly higher systolic blood pressure than the normal pressure controls (q = 2.55, df 2,35, ns). On diastolic blood pressure, a similar pattern was found. Untreated hypertensives displayed higher baseline values than treated hypertensives (q = 4.29, df 2,35, $p < .05$) and normal pressure controls (q = 7.07, df 2,35, $p < .01$). Treated hypertensives did not differ from the normal blood pressure controls (q = 2.79, df 2,35, ns) on this measure. Baseline heart-rate did not differ among the three experimental groups.

With regard to psychological factors, no group differences were observed on either social anxiety, trait anxiety, frequency of positive or negative self-verbalizations, or the Rating of Social Situations (ROSS). Group differences were observed on the Beck Depression and Social

Desirability scales. Both normal blood pressure subjects and treated hypertensives scored in the normal range and did not differ from each other (q = 0.44, df 2,35, ns) on the Beck depression scale. The untreated hypertensives, however, displayed lower depression scores than the treated hypertensives (q = 3.73, df 2,35, $p < .05$) and the normal blood pressure group (q = 3.29, df 2,35, $p < .05$). Untreated hypertensives also displayed higher scores on the Social Desirability Scale than the normal pressure group (q = 3.46, df 2,35, $p < .05$) but did not differ from the treated hypertensives (q = 1.44, df 2,35, ns) who were also comparable to the normal blood pressure controls (q = 2.02, df 2,35, ns). Table 7 displays mean scores and standard deviations for the psychological characteristics.

8.2 Self-Monitoring of Interpersonal Distress

The frequency of self-monitored stressful social interactions and the level of distress experienced were extracted from the self-monitoring diaries. Means and standard deviations for these measures are displayed in Table 8.

One-way analyses of variance and post-hoc tests (Newman-Keuls, $p < .05$) were executed to determine group differences. Untreated hypertensives reported less stressful interactions over the 2-week self-monitoring period than the treated hypertensives (q = 2.94, df 2,35, $p < .05$). The difference between untreated hypertensives and normal pressure subjects did not reach significance (q =2.67, df 2,35, ns).

Table 7

Psychological Characteristics

	Untreated Hypertensive		Treated Hypertensive		Normal Blood Pressure	
	M	(SD)	M	(SD)	M	(SD)
Social Anxiety and Distress (SAD)	7.0	(8.8)	10.3	(6.5)	9.9	(7.9)
Trait Anxiety (STAI)	33.3	(8.6)	39.8	(12.7)	40.5	(10.6)
Positive Self-Verbalizations (IPK-P)	16.3	(2.1)	15.3	(3.6)	13.4	(4.9)
Negative Self-Verbalizations (IPK-N)	3.7	(4.0)	6.6	(3.9)	6.9	(5.5)
Depression (BDI)	2.3	(2.2)	6.9	(4.3)	6.4	(4.5)
Rating of Social Situations (ROSS)	27.2	(29.8)	31.7	(19.7)	47.7	(28.4)
Social Desirability Scale (SDS)	20.1	(6.7)	17.7	(3.9)	14.2	(5.7)

M = Mean

SD = Standard Deviation

Table 8

Self-Monitoring Data

	Groups					
	Untreated Hypertensive		Treated Hypertensive		Normal Blood Pressure	
	M	(SD)	M	(SD)	M	(SD)
Frequency of Self-Monitored Distress (SM-F)	19.2	(18.0)	39.0	(29.0)	37.2	(20.7)
Level of Self-Monitored Distress (SM-L)	3.2	(1.8)	3.6	(0.8)	3.1	(1.0)

M = Mean

SD = Standard Deviation

Treated hypertensives reported as many stressful interactions as did the normal blood pressure control group (q = .27, df 2,35, ns). No group differences were found on level of distress experienced during self-monitoring.

Information provided in the self-monitoring diary was utilized to test whether any one type of social interaction had been reported as producing more distress than others. This comparison was based on the overall distress scores that were computed for each relationship category (spouse/family; work; friends/acquaintances; and strangers). Only three out of 38 subjects assigned the lowest distress score to social interactions with spouse and/or family members while 12 out of 38 subjects reported these interactions to have been most distressing. Three out of 38 subjects reported work interactions to be the least distressing, while 20 out of 38 considered work interactions as the most distressing type of social interaction. Twenty-three out of 38 subjects assigned the lowest distress score to social interactions with friends and acquaintances, while four out of 38 subjects reported these interactions as having been most distressing. Nine out of 38 subjects considered interactions with strangers as having been the least distressing type of interaction, and two out of 38 subjects assigned the highest distress scores to these interactions.

A X^2-test was conducted to evaluate whether social interactions in the four relationship categories were equally distributed as least and

most distressing. The resulting statistic was $X^2(3) = 17.88$ ($p < .001$). Social interactions with friends/acquaintances and strangers appeared to elicit little distress in most subjects while spouse/family interactions and work situations resulted in higher distress for the majority of subjects.

8.3 Stimulus Perception and Overt Behavior During the Role-Play Test

The subjects' post-experimental evaluation of subjective distress experienced in the role-play interactions and the perceived degree of reality of the situations which they had enacted were analyzed using 3 x 2 (groups x levels of distress) analyses of variance. A significant main effect for levels of distress was found ($F(1,35) = 34.2$, $p < .001$). No main effect for groups or groups x levels of distress interaction was observed.

Perceived degree of reality did not yield a main effect for groups or levels of distress, and no groups x levels of distress interaction was found. These results indicate that the role-play interactions were equally realistic for the three groups. The two distress levels, however, were subjectively experienced as different.

A one-way analysis of variance was executed to evaluate group differences on behavioral skill. All groups displayed comparable behavioral skill in the role-play interactions. Means and standard deviations for subjective distress experienced for perceived degree of reality and behavioral skill evaluations are displayed in Table 9.

Table 9

Stimulus Perception and Behavioral Skill During Low and High Distress Role-Play

Rating	Level of Distress	Groups: Untreated Hypertensive M	(SD)	Treated Hypertensive M	(SD)	Normal Blood Pressure M	(SD)
Perceived Distress	Low	2.6	(1.8)	2.7	(0.8)	2.6	(1.3)
	High	4.1	(2.3)	5.1	(1.6)	4.6	(2.2)
Perceived Degree of Reality	Low	6.4	(2.2)	6.6	(2.3)	5.9	(2.1)
	High	6.1	(1.6)	6.4	(1.9)	6.3	(2.3)
Behavioral Skill		44.0	(4.4)	45.1	(7.2)	45.7	(4.2)

8.4 Blood Pressure and Heart-Rate Responses During the Role-Play Test

Means scores and standard deviations for blood pressure and heart-rate change in low and high distress are shown in Table 10.

Blood pressure and heart-rate changes were analyzed by 3(groups) x 2(levels of distress) x 2(periods) analyses of variance.

Systolic blood pressure changes during the role-play test are depicted in Figure 2. Results from the 3-way ANOVA indicate a significant main effect for groups ($F(2,35) = 8.22$, $p < .001$) and for periods ($F(1,35) = 69.22$, $p < .001$) but not for levels of distress (low vs. high). No significant 2- or 3-way interactions were observed. Post-hoc tests using the Tukey method revealed that the treated and untreated hypertensives did not differ but displayed a hyperresponse on systolic blood pressure when compared with normal blood pressure subjects ($p < .01$).

Diastolic blood pressure changes are shown in Figure 3. A 3(groups) x 2(level of distress) x 2(periods) analysis of variance revealed a main effect for groups ($F(2,35) = 10.77$, $p < .001$) and a main effect for periods (baseline vs. distress ($F(1,35) = 31.39$, $p < .001$). Levels of distress (low vs. high) did not yield a significant main effect. However, a significant groups x levels of distress interaction was found ($F(2,35) = 5.39$, $p < .01$). The three-way interaction (groups x levels of distress x periods) was also significant ($F(2,35) = 4.05$, $p < .03$). Post-hoc analyses of the periods x levels of distress interaction within each group resulted in F-values of 2.74 (1,35) for untreated hypertensives (non-significant),

Table 10

Cardiovascular Reactivity During Low and High Distress

Variable	Level of Distress	Groups: Untreated Hypertensive M	Untreated Hypertensive (SD)	Treated Hypertensive M	Treated Hypertensive (SD)	Normal Blood Pressure M	Normal Blood Pressure (SD)
Systolic BP Change (mm Hg)	Low	+18.3	(14.6)	+18.2	(14.0)	+ 9.8	(13.1)
	High	+19.8	(9.8)	+18.7	(10.7)	+12.8	(11.4)
Diastolic BP Change (mm Hg)	Low	+ 9.3	(10.3)	+ 3.6	(12.0)	+6.1	(6.8)
	High	+ 2.7	(8.0)	+12.3	(13.5)	+ 9.5	(8.3)
Heart-rate Change (bpm)	Low	+ 5.0	(8.1)	+ 3.1	(3.6)	+ 6.1	(5.5)
	High	+ 3.2	(10.4)	+ 3.2	(5.2)	+ 7.7	(6.2)

M = Mean

SD = Standard Deviation

FIGURE 2
SYSTOLIC BLOOD PRESSURE CHANGES DURING LOW AND HIGH DISTRESS

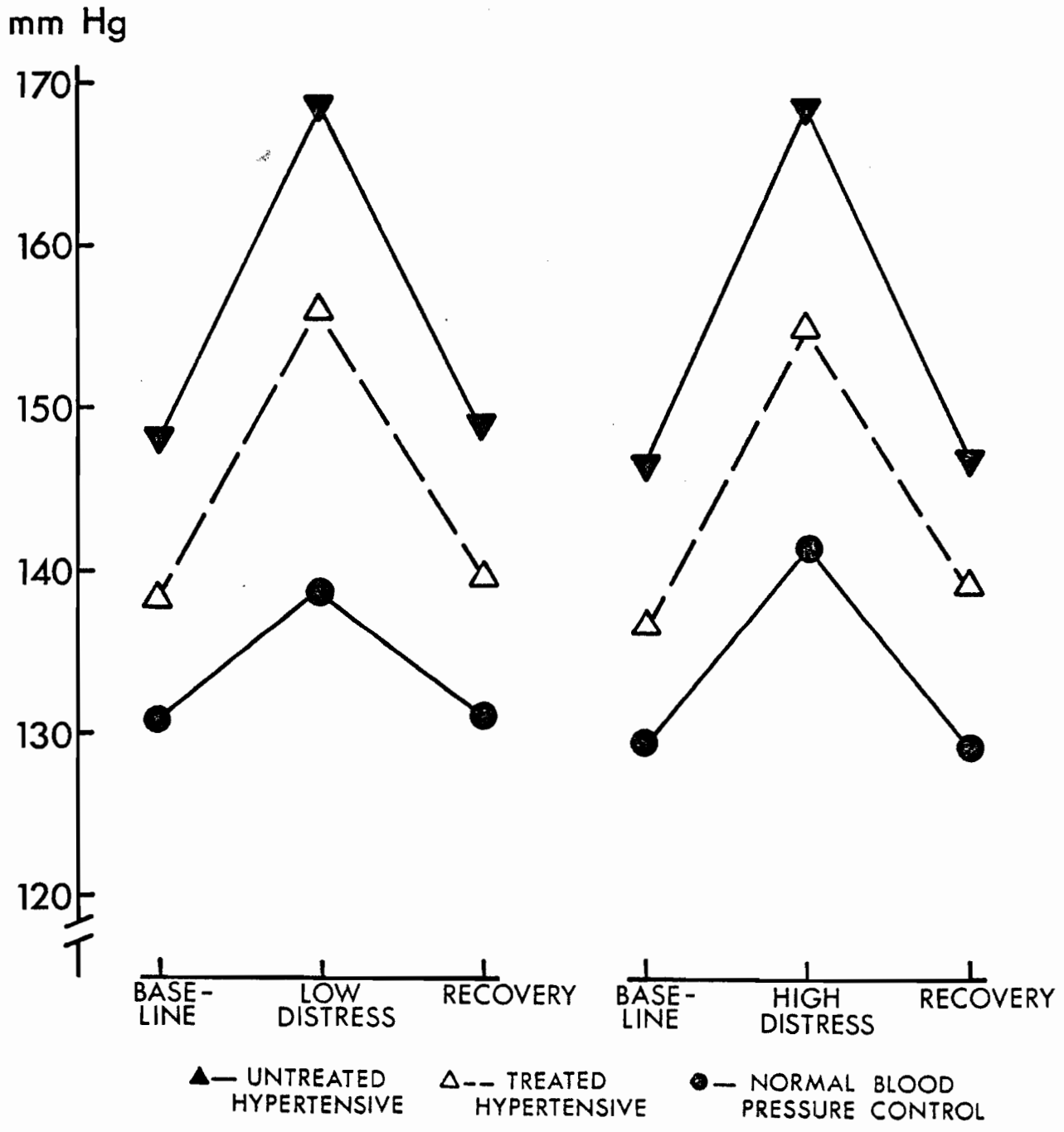
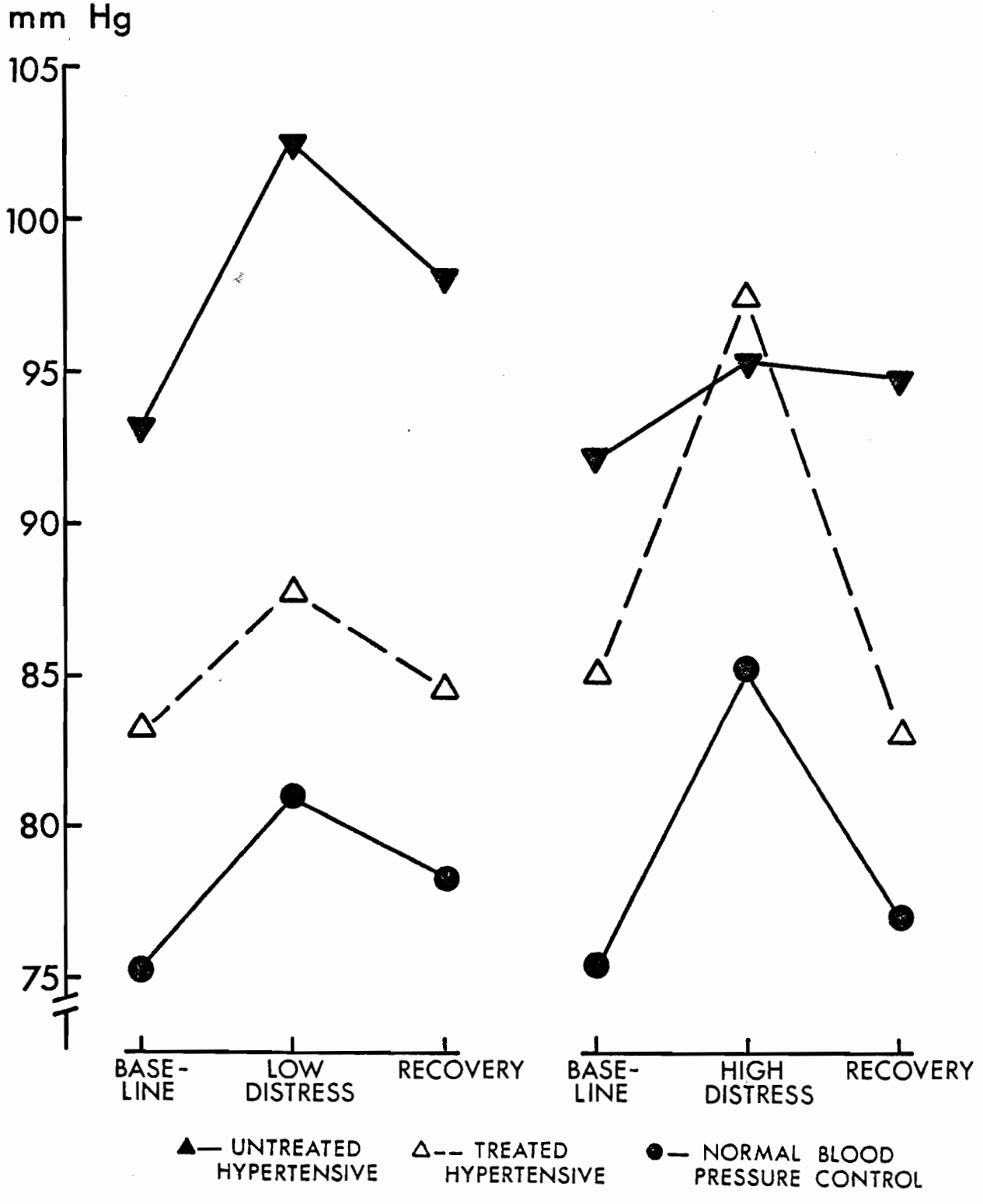


FIGURE 3
DIASTOLIC BLOOD PRESSURE CHANGES DURING LOW AND HIGH DISTRESS



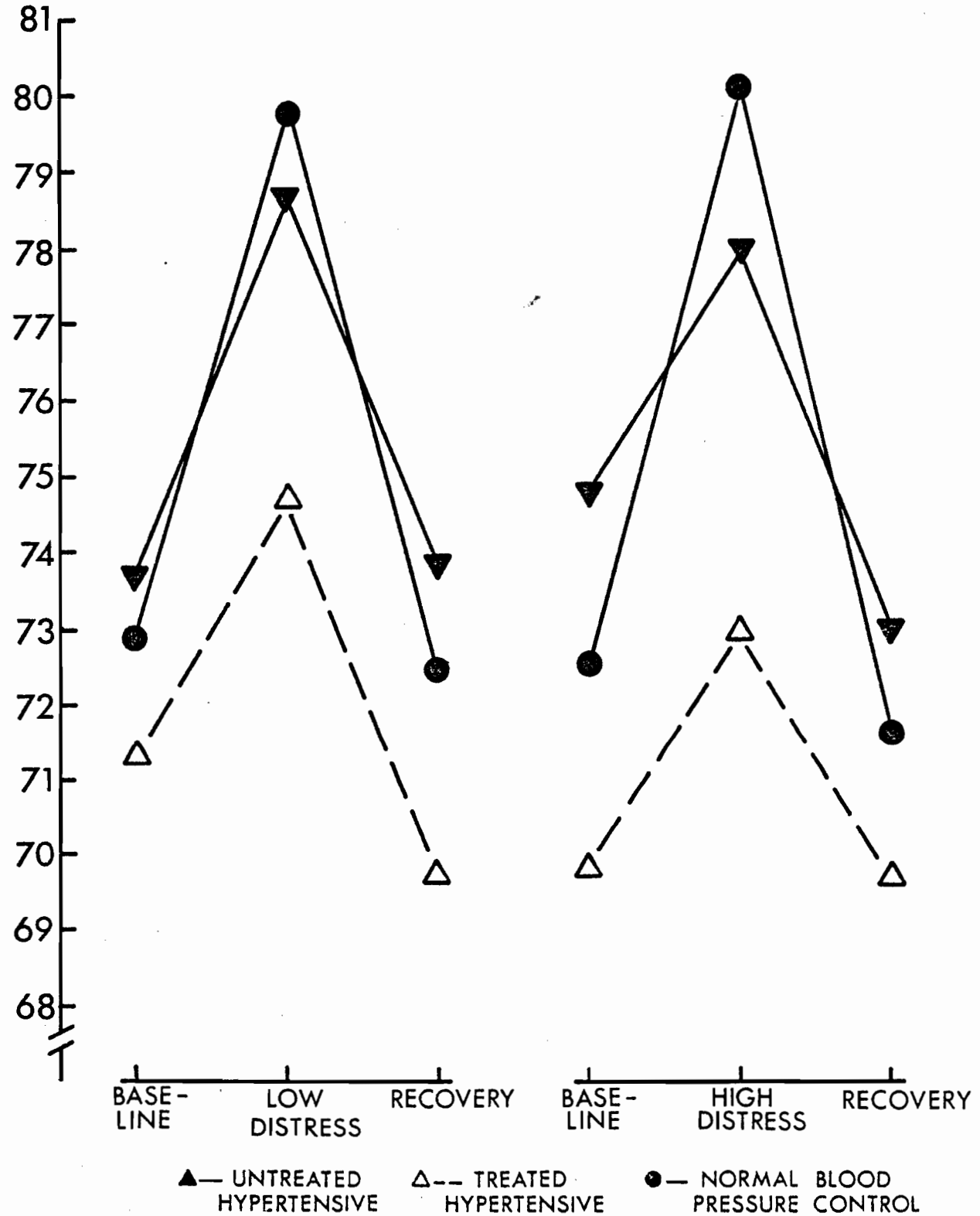
$F(1,35) = 5.86$, ($p < .05$) for treated hypertensives, and $F(1,35) = 1.00$ (ns) for the normal blood pressure control group. The interaction was significant in the treated hypertensive group only. In order to describe the effect of the groups x periods x levels of distress interaction, t-tests were executed for all possible comparisons within each group; i.e., pre-test baseline vs. low distress reactivity, pre-test baseline vs. high distress reactivity, pre-test baseline prior to low distress vs. pre-test baseline prior to high distress, and low distress reactivity vs. high distress reactivity. For the untreated hypertensives, baselines were found equivalent ($t(63) = 0.51$, ns). Low distress led to a significant increase in diastolic blood pressure ($t(63) = 4.31$, $p < .001$). In the high distress situations, however, blood pressure during distress was not higher than during the preceding baseline ($t(63) = 1.64$, ns). Equally, the low distress response was markedly higher than during high distress ($t(63) = 3.18$, $p < .001$). For the treated hypertensive group baselines were equal ($t(63) = 0.56$, ns), but only the high stress condition led to significant increases in diastolic blood pressure, ($t(63) = -5.76$, ($p < .001$ respectively). Furthermore, the high distress condition was associated with greater diastolic pressure increase ($t(63) = -4.57$, $p < .001$) than low distress. The normal blood pressure group also had comparable baselines ($t(63) = 0.03$, ns) and large increases in both distress conditions ($t(63) = 0.03$, ns) and large increases in both distress conditions ($t(63) = -4.19$, $p < .001$, and $t(63) = -6.53$, $p < .001$). High distress also led to enhanced reactivity when compared to low distress ($t(63) = -2.34$, $p < .05$).

A 3(groups) x 2(levels of distress) x 2(periods) analysis of variance was computed for heart-rate change and indicated no main effect for groups or levels of distress. A significant periods (baseline vs. distress) main effect was observed for heart-rate increase ($F(1,35) = 21.42$, $p < .001$). No significant two- or three-way interaction was detected. Heart rate change is displayed in Figure 4.

Recovery of systolic and diastolic blood pressure was analyzed using a 3(groups) x 2(levels of distress) x 6(periods) repeated measures analyses of variance in which the pre-distress baselines were compared with each of the five pressure values recorded at 1-minute intervals throughout the 5-minute recovery period.

The 3(groups) x 2(levels of distress) x 6(periods) analysis of variance executed on systolic blood pressure recovery revealed a significant main effect for groups ($F(2,35) = 7.97$, $p < .01$) and a main effect for periods ($F(5,175) = 25.30$, $p < .001$) as well as a groups x periods interaction ($F(10,175) = 2.59$, $p < .01$). There were no main effects for level of distress or any additional two- or three-way interactions. These data indicate that recovery was independent of level of distress. Post-hoc t-tests using the Dunnett procedure were executed on the groups x periods interaction. Dunnett's method controls for type I errors when a number of experimental group means are compared with one control condition or baseline (Winer, 1971). The post-hoc tests revealed that the systolic blood pressure of untreated hypertensives remained elevated for a three minute duration following the interpersonal stressor situations.

FIGURE 4
HEART RATE CHANGES
DURING LOW AND HIGH DISTRESS



Treated hypertensives maintained elevated systolic pressures for a two-minute period while normal blood pressure controls displayed full recovery of systolic blood pressure following the first minute of recovery. Results from these post-hoc comparisons are indicated in Table 11.

The 3(groups) x 2(levels of distress) x 6(periods) analysis of variance was also computed on diastolic blood pressure recovery. This analysis revealed main effects for groups ($F(2,35) = 12.56$, $p < .001$) and a significant main effect for periods ($F(5,175) = 8.03$, $p < .001$). A post-hoc test on the groups main effect with the Newman Keuls method indicated that the untreated hypertensives displayed higher diastolic blood pressure than the treated hypertensives ($q = 3.00$, $p < .05$) and the normal blood pressure controls ($q = 4.76$, $p < .01$). Diastolic blood pressure of treated hypertensives did not differ from the normal blood pressure controls ($q = 1.75$, ns).

A post-hoc test on the periods main effect was executed with Dunnett t-tests comparing the pre-distress baseline with the diastolic blood pressure at each of the five 1-minute intervals. The results indicate that significant recovery took place after the first minute of recovery only ($t(175) = -4.57$, $p < .01$). No significant two- or three-way interactions were obtained, thus indicating that the rate of diastolic blood pressure recovery was also independent of the level of distress.

A 3(groups) x 2(levels of distress) x 2(periods) analysis of variance was conducted on heart rate recovery. No main effect for groups or levels of distress was found. The periods main effect (distress vs. recovery), however, indicated significant recovery ($F(1,35) = 32.92$, $p <$

Table 11

Dunnett's t-values for post-hoc tests on systolic blood pressure recovery

Recovery Minute	Group		
	Untreated Hypertensive	Treated Hypertensive	Normal Blood Pressure Control
1	-6.27**	-5.41**	-4.07**
2	-3.40**	-3.86**	-0.85
3	-2.25*	-1.58	-1.14
4	-0.52	-0.57	-0.50
5	-0.57	-0.72	-0.14

** $p < .01$

* $p < .05$

.001). No groups x recovery,levels of distress x recovery or three-way interaction were found.

8.5 Empirical Validation of Low and High Distress

A partial validation of the experimental operationalization of low and high distress was attempted by: (1) contrasting the subjective distress that individuals had experienced during low and high distress role-play; (2) comparing the perceived degree of reality in low/high distress; (3) comparing those ROSS-scores which subjects had assigned in Phase I to the same situations which they actually enacted as low/high distress role-plays in Phase III; and (4) contrasting the observer evaluations of role-player behavior in the low and high distress role-play situations.

The 3(groups) x 2(levels of distress) analysis of variance executed above on distress rating had indicated that the subjects experienced high distress as significantly more unpleasant than low distress role-play interactions. Results from the second 3 x 2(groups x levels of distress) analysis of variance computed on perceived degree of reality data had indicated that the role-play interactions were considered equally realistic on both distress levels and for all three groups.

A 3(groups) x 2(levels of distress) analysis of variance was computed on the ROSS-scores which subjects had assigned to the role-play

interactions in low/high distress. No main effect for groups was found; level of distress, however, yielded a significant main effect ($F(1,35) = 13.73$, $p < .001$). The groups x levels of distress interaction was not significant. These findings indicate that in the high distress condition subjects had enacted role-play descriptions that they had evaluated earlier as particularly difficult to cope with. (mean scores are displayed in table 12).

Role-player behavior was also analyzed using a 3(groups) x 2(levels of distress) analysis of variance. This analysis revealed no main effects for groups. Level of distress, however, yielded a significant main effect ($F(1,35) = 257.84$, $p < .001$). No groups x levels of distress interaction was found. These results indicate that role-players displayed less cooperativeness and more unfriendly behavior in high than in low distress role-play interactions. Across groups, however, player behavior appeared comparable within each level of distress. (mean scores are displayed in table 12).

These findings, taken as a whole, consistently support the validity of the operationalization of low versus high distress social interactions.

8.6 Intercorrelations of Experimental Variables and the Prediction of Hypertension

Pairwise intercorrelations on psychological, self-monitoring, behavioral skill and physiological baseline data were computed for the total sample ($N = 38$). The resulting Product-Moment correlation co-

Table 12

Role-Player Behavior and ROSS-Scores Assigned to Individual Role-Play Interactions

Variable	Level of Distress	Groups: Untreated Hypertensive M	(SD)	Treated Hypertensive M	(SD)	Normal Blood Pressure M	(SD)
Role-Player Behavior	Low	3.2	(0.6)	3.3	(0.6)	3.4	(0.9)
	High	6.2	(1.1)	7.1	(0.8)	6.8	(1.0)
ROSS-Scores	Low	17.8	(28.3)	16.7	(15.9)	27.7	(18.8)
	High	30.7	(42.0)	36.0	(18.4)	67.3	(50.1)

M = Mean

SD = Standard Deviation

efficients are depicted in Table 13.

Social and trait anxiety, self-verbalizations (both negative and positive), and depression scores consistently intercorrelate, with r's ranging from .28 to .80. Scores on the Social Desirability Scale (SDS) were negatively correlated with social anxiety ($r = -.36$). A significant correlation was also found between SDS scores and diastolic blood pressure ($r = .38$) indicating more pronounced defensiveness with higher diastolic blood pressure. Subjects who tended to rate social situations as particularly distressing also displayed more social anxiety and avoidance behaviors ($r = .42$), reported more stressful social interactions during self-monitoring ($r = .33$) and were rated to possess less behavioral skill during role-play interactions ($r = -.36$). Systolic blood pressure was found to correlate negatively with the frequency of self-monitored stressful interactions ($r = -.35$). Subjects with elevated systolic blood pressure also displayed elevated diastolic blood pressure ($r = .43$). Heart-rate did not correlate with psychological variables and systolic and diastolic blood pressure baselines.

In order to determine the specificity of psychological, physical and cardiovascular variables with regard to group membership (normal blood pressure, treated or untreated hypertensive), a discriminant function analysis was conducted. In this multivariate statistical procedure, predictor variables are analyzed for their potential in predicting group membership without consideration of the original grouping variable (i.e., blood pressure). Results of this analysis are shown in Table 14.

Table 13

Pairwise Intercorrelations of Personality, Self-Monitoring, Behavioral Skill, and Physiological Baseline Data (N = 38)

	SAD	STAI	IPK-P	IPK-N	BDI	SDS	ROSS	SM-F	SM-L	SKILLS	SBP	DBP
STAI	.40*											
IPK-P	-.43**	.61***										
IPK-N	.33*	.66***	-.28									
BDI	.49**	.80***	-.53***	.78***								
SDS	-.36*	-.28	.21	-.24	-.31*							
ROSS	.42**	.27	-.20	.24	.24	-.16						
SM-F	.02	.12	-.12	.06	.15	.02	.33*					
SM-L	.32*	.11	-.05	.27	.23	.14	.28	.10				
SKILLS	-.05	-.27	-.05	-.33*	-.22	-.13	-.36*	-.14	-.24			
SBP	-.10	-.18	.23	-.02	-.08	.09	-.26	-.35*	.03	-.05		
DBP	-.08	-.20	.14	-.24	-.25	.38*	-.31*	-.19	.26	.02	.42**	
HR	.00	.00	-.02	.05	.04	.02	-.32*	-.16	-.12	.05	.06	.06

* $p < .05$
** $p < .01$
*** $p < .001$

Table 14

Discriminant Function Classification Results Based On Physical, Personality, Self-Monitoring, Behavioral Skill and Cardiovascular Baseline Data

Actual Group	Cases	Group Membership Correctly Predicted					
		Untreated Hypertensive		Treated Hypertensive		Normal Blood Pressure	
Untreated Hypertensive	9	7	(77.8%)	0	(0%)	2	(22.2%)
Treated Hypertensive	9	0	(0%)	8	(88.9%)	1	(11.1%)
Normal Blood Pressure	20	1	(5.0%)	3	(15.0%)	16	(80.0%)

Note. Total Percent of Group Cases Correctly Classified: 81.58%

As Table 14 indicates, a large proportion of actual group membership (81.24%) can be predicted by seven variables that contributed significantly to the equation. Five of these variables are related to cognitive functioning and social competence (i.e., social desirability, frequency of self-monitored distress, behavioral skills, social anxiety, and Rating of Social Situations).

Pairwise relationships between blood pressure and heart rate responses and role-play stimulus characteristics (i.e., perceived distress and degree of reality) were evaluated by Pearson Product-Moment correlations. Given that the experimental procedure led to distinctive response patterns across the experimental groups, regression analyses were conducted separately for each group.

Systolic blood pressure change in untreated hypertensives during low distress situations were larger when the situations were perceived as distressing ($r = .69$). This finding was not replicated in the high distress condition. Systolic blood pressure change during low distress situations did not correlate with the degree of reality of the role-play situations. In the high distress situations, however, untreated hypertensives were found to display less increase in systolic blood pressure the more they perceived the role-play situations to be realistic ($r = -.74$). Systolic and diastolic blood pressure changes were observed to correlate positively with each other during low distress situations ($r = .74$) and during high distress situations ($r = .71$).

Diastolic blood pressure change in untreated hypertensives in low distress situations did not correlate with perceived distress or degree of reality, but was found to be related to diastolic blood pressure change during high distress (r = .71). Also, diastolic pressure change in the high distress condition correlated with social anxiety (r = .78). Untreated hypertensives displayed less diastolic blood pressure change during high distress situations the more realistic they considered the situations to be (r = -.75).

Heart-rate of untreated hypertensives in low distress conditions did not increase in proportion to perceived distress or degree of reality, nor were heart-rate changes related to other physiological response parameters. During high distress situations, however, heart-rate changes were associated with degree of reality (r = .78), indicating greater increases when situations were perceived as particularly realistic. Heart-rate change in low distress situations also correlated with heart-rate change in high distress (r = .75). It is interesting to note that systolic blood pressure and heart-rate responses in the low distress conditions were predictive of responses to the high distress condition. On diastolic pressure, however, the low and high distress responses were not related.

In treated hypertensives, systolic blood pressure changes did not correlate with situation characteristics or physiological activity indices. In high distress situations, baseline heart-rate was inversely proportional to systolic blood pressure change (r = -.74). Diastolic

blood pressure responses to low distress situations correlated only with degree of reality (r = .78) while in high distress situations no significant associations were found. Heart-rate responses also did not correlate with either situation characteristics or blood pressure change indices. Heart-rate change in low distress conditions was predictive of heart-rate change in high distress role-play interactions (r = .89).

For the normal blood pressure control group, systolic, diastolic pressure changes and heart-rate responses could not be predicted by situation characteristics or other cardiovascular indices. Systolic blood pressure and heart-rate change during the low distress role-play interactions were associated with systolic pressure and heart-rate change during the high distress conditions (r = .69, and r = .67, respectively).

In order to determine whether physiological response patterns as described above can increase the precision of group membership prediction, a second discriminant function analysis (DFA) was executed which included all psychological, physical, and physiological baseline as well as response variables. The results are displayed in Table 15.

When comparing these results to the findings of the DFA which involved no response indices, it appears that the physiological response pattern lacked specificity in contributing to a group membership prediction: the percentage of cases correctly classified increased only 2.63% from 81.58% to 84.21%. As can be seen from the

Table 15

Discriminant Function Classification Results Based on Physical, Personality, Self-Monitoring, Behavioral Skill, and Cardiovascular Baseline and Response Data

Actual Group	Cases	Group Membership Correctly Predicted					
		Untreated Hypertensive		Treated Hypertensive		Normal Blood Pressure	
Untreated Hypertensive	9	8	(88.9%)	0	(0%)	1	(11.1%)
Treated Hypertensive	9	1	(11.1%)	8	(88.9%)	0	(0%)
Normal Blood Pressure	20	0	(0%)	4	(20.0%)	16	(80.0%)

Note. Total Percent of Group Cases Correctly Classified: 84.21%

isting of standardized canonical discriminant function coefficients, the hypertensives' hyperresponsivity on systolic blood pressure was the only response index which was added to the regression equation as a significant predictor variable.

The strength of the contribution that various psychological factors can make regarding the prediction of cardiovascular baseline variables was investigated by conducting step-wise multiple regression analyses. A set of predictor variables was utilized to predict systolic blood pressure. These included the psychological predictors, social and trait anxiety, depression, positive and negative self-verbalization, defensiveness, rating of social situations, frequency and perceived level of distress of self-monitored stressful interactions, overt behavioral skill, and physical predictors included diastolic blood pressure, heart-rate, age, and weight. Physical predictors of diastolic pressure were systolic blood pressure, heart-rate, age, and weight. Physical predictors of heart-rate were systolic and diastolic blood pressure, age, and weight.

The step-wise multiple regression procedure is recommendable when the number of predictor variables is large, and therefore one variable or a set of variables may be redundant to the prediction of a dependent variable (Thorndike, 1976, p. 160). The step-wise regression procedure permits the determination of the independent contributions of each predictor variable to the regression equation. The analyses proceeded

until the tolerance limit did not permit further stepping. Summary tables for the prediction of systolic and diastolic pressure and heart-rate are displayed in Tables 16, 17, and 18.

The six variables which explained a significant amount of the total variance in systolic blood pressure at the $p < .05$ level were in order of relative importance: diastolic blood pressure, frequency of self-monitored stressful interactions, positive self-verbalizations, depression, weight and age. These six variables accounted for 33% of the total variance. The psychological variables accounted for one third (11%) of the total intraindividual variability in systolic blood pressure.

The nine variables which explained a significant amount of the total variance in diastolic blood pressure at the $p < .05$ level were in order of relative importance: systolic blood pressure, defensiveness, weight, rating of social situations, social anxiety, depression, trait anxiety, heart-rate, negative self-verbalizations. These nine variables accounted for 42% of the total variance. The psychological predictor variables alone accounted for nearly half (19.6%) of the intra-individual variability. No variable was found to predict a significant amount of the total variance in intraindividual heart-rate variability.

Table 16

Step-Wise Multiple Regression Summary Table Using Systolic Blood Pressure as the Dependent Variable

Variable	Multiple R	Multiple R^2	Stand. Regr. Coeff.	F	Independent Variance Accounted For
Diastolic Blood Pressure	.432	.186	.33	8.24**	19.8%
Frequency of Self-Monitored Stressful Interactions	.510	.260	-.29	6.14**	14.7%
Positive Self-Verbalizations	.529	.280	.21	4.41*	10.6%
Depression	.550	.303	.28	3.58*	8.6%
Weight	.568	.322	.11	3.04*	7.3%
Age	.578	.334	-.19	2.59*	6.2%
Trait Anxiety	.587	.345	-.25	2.26	5.4%
Defensiveness	.593	.352	.11	1.97	4.7%
Negative Self-Verbalizations	.599	.359	.15	1.74	4.2%
Heart-rate	.603	.363	-.07	1.54	3.6%

* $p < .05$

** $p < .01$

Table 17

Step-Wise Multiple Regression Summary Table Using Diastolic Blood Pressure as the Dependent Variable

Variable	Multiple R	Multiple R^2	Stand. Regr. Coeff.	F	Independent Variance Accounted For
Systolic Blood Pressure	.432	.186	.30	8.24**	16.5%
Defensiveness	.529	.280	.28	6.79**	13.6%
Weight	.558	.312	.24	5.13**	10.3%
Rating of Social Situations	.580	.336	-.29	4.18**	8.4%
Social Anxiety	.606	.367	.29	3.71**	7.4%
Depression	.622	.386	-.30	3.25*	6.5%
Trait Anxiety	.640	.409	.28	2.96*	5.9%
Heart-rate	.647	.418	-.10	2.60*	5.2%
Negative Self-Verbalizations	.648	.421	-.08	2.26*	4.5%

* $p < .05$

** $p < .01$

Table 18

Step-Wise Multiple Regression Summary Table Using

Heart-Rate as the Dependent Variable

Variable	Multiple R	Multiple R^2	Stand. Regr. Coeff.	F	Independent Variance Accounted For
Rating of Social Situations	.317	.100	-.40	4.01	10.8%
Weight	.370	.137	.31	2.78	7.5%
Social Anxiety	.417	.174	.20	2.38	6.4%
Diastolic Blood Pressure	.439	.193	-.13	1.97	5.3%
Negative Self-Verbalizations	.455	.207	.16	1.67	4.5%
Age	.470	.221	-.15	1.47	4.0%
Systolic Blood Pressure	.474	.225	-.10	1.24	3.3%
Frequency of Self-Monitored Stressful Interactions	.479	.229	-.08	1.08	2.9%
Defensiveness	.483	.234	-.09	0.95	2.4%

9.0 Discussion

9.1 Interpretation of Findings

The overall hypothesis that mild hypertensives display a distinctive response pattern to stressful social interactions is supported by the present findings. In addition, the utility of a methodology that incorporates individually relevant interpersonal distress stimuli was demonstrated. The prediction of low social skill with concomitant elevated anxiety in hypertensives, however, was not supported for treated or untreated hypertensives. The expected blood pressure hyperresponsivity in hypertensives was found only on systolic blood pressure. Overall, it appears that the psychophysiological response pattern of mild hypertensive individuals in social interactions is more complex than proposed in the initial social competence model (Linden and Feuerstein, 1981).

Demographic, physical and physiological baseline data indicated that the experimental groups were well matched on weight and education. Treated hypertensives were somewhat older than normal blood pressure controls and treated hypertensives. This difference in all likelihood reflects differential prescription habits of family physicians. Given comparable blood pressure levels, older hypertensives are more likely to receive antihypertensive medication (Davine, Note 4). In the population at large, blood pressure is known to increase with age (Freis, 1978) and may therefore be confounded with age. This effect, however, was not observed in the present study as the resting blood pressure levels did not correlate with the age of subjects ($\underline{r}$ = -.02 systolic, and $\underline{r}$ = .03 for diastolic). The

blood pressure baseline of untreated hypertensives reflected values in the borderline to mild hypertensive range while the arterial pressure found in treated hypertensives indicated that the elevated pressure was under control.

Results of the personality measurements indicated that all of the experimental groups displayed scores in the normal range. Treated hypertensives closely resembled the normal blood pressure controls; however, untreated hypertensives displayed low scores on the depression scale and, as indicated by elevated scores on the Social Desirability Scale, displayed a repressive - defensive cognitive style. Untreated hypertensives reported less subjective distress when imagining themselves in the hypothetical ROSS interaction and fewer stressful social interactions during self-monitoring. These variables were also found to be among the best predictors of group membership in the discriminant analysis. These findings can be integrated with prior findings on the impact of defensiveness in stress research (Burkhart et al., 1979; Kiecolt and McGrath, 1979; Weinberger et al., 1979). Weinberger et al. found that repressors who are defined as reporting low trait anxiety but high defensiveness appeared more stressed on a variety of physiological and behavioral measures than individuals with comparably low trait anxiety and low defensiveness as indicated by their scores on the Crown-Marlowe Social Desirability Scale (1964). Burkhart et al. (1979) and Kiecolt and McGrath (1979) reported a comparable phenomenon in the assessment of assertiveness and low vs. high levels of defensiveness. Data from these studies suggest that some individuals display a repressive coping

pattern on self-report of anxiety and assertiveness. It is essential to the definition of a 'repressor' that the repressive cognitive response is inconsistent with simultaneously observed physiological responses.

The untreated hypertensives in the present study were characterized by this repressive-defensive cognitive pattern as is reflected in their elevated scores on defensiveness, their low depression scores, their low subjective distress experience in hypothetical interpersonal interactions, and the fewer reports of stressful social interactions during self-monitoring.

The untreated hypertensives' repressive-defensive style was directly associated with blood pressure as SDS scores increased with increases in resting diastolic blood pressure. In addition, subjects with elevated systolic blood pressure reported fewer stressful social interactions during self-monitoring.

The observation of a repressive cognitive style in hypertensives was reported in prior research (Sapira, et al., 1971). Sapira presented hypertensives and normotensives with two films with a patient-doctor interaction; one depicting rude, disinterested behavior on the part of a physician, the second showing a relaxed and warm atmosphere. During post-experimental interviews, normotensives reported behavioral differences in the two physicians while hypertensives did not. Sapira and his coworkers interpreted this finding as a tendency in hypertensives to screen out potentially noxious stimuli.

Preliminary results from a 3-year prospective study on air traffic

controllers (Hurst, Anderson, Jenkins and Kreager, Note 5) also support the claim that untreated hypertensives tend to be more repressive-defensive. Hurst et al. reported that higher diastolic resting pressure, a lower "subjective cost", a higher observed investment in the air traffic controller identity, and a higher level of peer evaluated amicability was the most parsimonious set of predictors of future hypertension in this group. "Subjective cost", defined as the negative impact of the air traffic control job on an individual's private and social life, was the greatest predictor in this set of variables. Individuals who did not develop hypertension had reported significantly higher initial subjective cost. A discriminant analysis indicated that 74% of cases could be correctly classified based upon the predictor set.

The findings of comparable social skill in hypertensives contrasts with Harris, et al. (1953) and Kalis, et al. (1957). Other behavioral evaluations of hypertensives, however, have been conducted simultaneously with the present study, and initial reports (Baer, Vincent, Williams, Bourianoff and Bartlett, 1980; Appel, Gorkin, and Holroyd, Note 6) also fail to observe specific skill deficits. Baer, et al. (1980) analyzed interactions of families with and without a hypertensive father and reported the absence of behavioral differences on either speech content or delivery characteristics. Appel, et al. (Note 6) studies normotensive and pre-hypertensive young adults during role-play interactions and did not detect behavioral differences in role-play interactions. Three arguments may be advanced to explain this discrepancy. It is possible that the findings of the Harris and Kalis group (1953, 1957) cannot be replicated for reasons not yet determined. Secondly, while Harris et al. (1953) and Kalis et al. (1957) had

utilized rating measures with largely unidentified psychometric and validational properties, more recent investigations including the present one incorporated scales whose methodological properties have been determined in several studies with diverse populations (Eisler, et al., 1973, 1975; Shepherd, 1977, 1978). A third explanation for the discrepancy between the present results and those of earlier research relates to sex differences across the various studies. The earlier research (Harris, et al., 1953; Kalis, et al., 1957) reported findings based upon female subjects, while the present study as well as those of Baer, et al., (1980) and Appel, et al. (Note 6) evaluated pre-hypertensive and hypertensive males. Research on social competence has indicated that males are likely to differ from females in their social coping behavior (Eisler, et al., 1973, 1975; Linden and Wright, 1980; Pearlin and Schooler, 1978). It is therefore suggested that evaluations of social skills in hypertensive individuals may also reveal sex differences in response to similar social interactions.

It is possible that the repressive-defensive bias displayed by untreated hypertensives on the personality measures may have influenced the situational perceptions of the role-play interactions in this group as well; however, this was not observed. All groups perceived the role-play situations as minimally distressing during low distress interactions, and highly distressing during the high distress interactions. In addition, all role-enactments were perceived as being equally realistic. One explanation for this lack of response bias during the situational assessment

revolves around the high demand characteristics of the role-play situation. It is possible that demand characteristics were minimal during questionnaire responding leading untreated hypertensives to be more likely to present themselves in a particularly positive light. However, during role-play, demand characteristics may have been high given the transparency of experimental contingencies; that is, subjects had to be informed pre-experimentally for ethical reasons that they would be asked to enact role descriptions that represented differential levels of distress which may have led them to be more aware of the experimental design.

Blood pressure hyperresponsivity in hypertensives was observed only on systolic blood pressure. Heart-rate changes were equivalent across all groups. The experimental groups displayed distinctive and contrasting responsivity on diastolic blood pressure. This distinctive responsivity appears particularly pertinent as diastolic pressure is more closely related to peripheral resistance and is therefore considered more clinically relevant (Boyd, 1972; Gantt, 1972). For the treated hypertensives and the normal blood pressure controls, greater arousal was observed in high than in low distress role-play situations, thereby validating the experimental hypothesis of a distress gradient. Untreated hypertensives, however, increased diastolic pressure in the low distress condition and failed to display any significant diastolic response during the high distress situations. This phenomenon has not been previously reported. The argument of insufficient stimulus impact for the untreated hypertensives in this particular distress condition cannot explain this finding as multiple indices (report of perceived distress and degree of reality, ratings of

role-player behavior, and ROSS scores of the enacted situations) substantiated the validity of the operationalization of low and high interpersonal distress in the role-play test for all groups. The possibility that the lack of a diastolic response in high distress was due to a ceiling effect can also be countered as the untreated hypertensives had already displayed higher absolute diastolic values during low distress role-play interactions.

It appears more likely that the inverse diastolic response pattern found in untreated hypertensives is attributable to the novel methodology in the present study which controls for individual relevance of role-play stimuli in low and high distress conditions. A number of observations on role-play situation characteristics support the argument that in untreated hypertensives the high distress condition had elicited an interaction of psychological and physiological responses whose quality was markedly different from the responses in the low distress condition. A number of significant intercorrelations between role-play situation characteristics, personality traits, and measures of blood pressure and heart-rate were found for the untreated hypertensives, while such intercorrelations were typically not observed in treated hypertensives and normal blood pressure controls.

Social anxiety was related to diastolic blood pressure change in untreated hypertensives but only during high distress situations (r = .78). Untreated hypertensives displayed a smaller rise in systolic (r = -.74) and diastolic (r = -.75) blood pressure the more realistic the situations were perceived as being. This interaction was not observed during low distress.

This situation-specific attenuation of blood pressure appears to have a personality trait equivalent as indicated by the repressive-defensive trait observed in self-report measures.

In addition, systolic and diastolic pressure changes were positively intercorrelated during low (r = .74) and high distress situations (r = .75), but only among the untreated hypertensive sample.

The fact that the diastolic pressure attenuation observed in untreated hypertensives was not evident in systolic blood pressure may be explained in two ways. The data suggest that the attenuating mechanism took significant effect only on diastolic pressure. On the other hand, it can be argued that the systolic blood pressure changes would have been even greater than observed if some type of attenuating mechanism would not have prevented greater increases. Some support for this second argument is found in the inverse relationship between perceived degree of reality and systolic pressure change during high distress. It is difficult to interpret the attenuation response as it is novel in the literature, and insufficient data are available regarding the cognitive processes of untreated hypertensives during role-enactments. Nevertheless, the present findings raise the question of whether untreated hypertensives may be capable of attenuating blood pressure elevations through some type of cognitive coping mechanism. The fact that a potential attenuation effect was noted during high distress conditions suggests that it might be subject to an individual's awareness and control such that it is activated only when a significant psychological threat is perceived. A repressive-

defensive mechanism might therefore have a protective function for individuals with elevated blood pressure.

9.2 Reformulation of the Social Competence Deficit Hypothesis

How can the present findings be integrated with the original social competence hypothesis? The present study was designed to evaluate whether a social competence deficit exists in hypertensives and whether it can account for the maintenance of elevated blood pressure. The findings suggest that the hypothesized mediation of social competence is not generally supported for hypertensives but that one aspect of the social competence paradigm, namely, social anxiety, may be relevant for a subgroup of hypertensive individuals, particularly as it affects diastolic pressure. Untreated hypertensive subjects who had reported social anxiety had also revealed proportionately greater increases in diastolic blood pressure during highly distressing role-play interactions. In contrast, blood pressure changes in normal blood pressure controls and treated hypertensives were not related to social anxiety.

Despite the fact that hypertensives were not differentially anxious or socially unskilled, conflicting social interaction was found to produce a more pronounced blood pressure response (higher systolic pressure and slower recovery) in treated and untreated hypertensives than in normal blood pressure controls, a finding consistent with prior research (Sapira, et al., 1971; Schachter, 1957). Resting heart rate levels and responses to the distress stimuli were found comparable in hypertensive and normotensive groups.

The findings from the present study, taken as a whole, suggest that untreated borderline and mild hypertensives display a complex response pattern to interpersonal stressors that is characterized by a repressive-defensive cognitive style and an associated attenuation of diastolic pressure response during high distress. The formulation of a protective mechanism in hypertensives, however, remains speculative. Systematic research must be conducted to identify more specifically how and when the attenuation mechanism was acquired and which interoceptive cues and potential cognitive strategies permit the attenuation of blood pressure change. An important issue for such research is the degree of awareness and control that individuals have over their visceral functions.

Research on the awareness and voluntary control of blood pressure has indicated marginal levels of blood pressure awareness (Luborsky, Brady, McClintock, Kron, Bortnichak, and Levitz, 1976; Shapiro, Redmond, McDonald, and Gaylor, 1975). These studies, however, did not systematically investigate which interoceptive cues were utilized for the estimation of blood pressure levels or which cognitive strategies were applied to influence arterial pressure. Hyper- and normotensives' blood pressure awareness have not been compared in these studies. Luborsky, et al. (1976), for example, combined treated hypertensives, untreated hypertensives and normal blood pressure controls and treated the findings independent of group membership. Their finding of limited awareness of blood pressure levels was not unexpected given the complexity of interacting psychophysiological functions that affect blood pressure. Of those physiological components that make

up the blood pressure determination equation (blood pressure = heart rate - stroke volume - peripheral resistance), only heart rate and the perception of heart rate have usually been studied (cf. Ashton, White, and Hodgson, 1979; McFarland, 1975; Schandry and Specht, Note 7). Significant correlations between heart rate and perception of heart rate have been observed but it has also been noted that this effect may be easily confounded with respiratory rather than heart rate change (McFarland, 1975). Research on the perception of the separate components of the blood pressure determination equation (i.e., heart rate, stroke volume, peripheral resistance) and their interactions, particularly in normo- versus hypertensive populations, is needed in order to further the understanding of potential interactions of cognitive variables and blood pressure change.

9.3 Implications of the Present Findings

The present findings have both methodological and theoretical implications for research on the relationship between personality variables and responses to stress.

Observations from the present study permit some general conclusions regarding the nature of interrelationships of blood pressure and heart rate. Systolic pressure change in low distress consistently predicted systolic pressure change in high distress conditions; heart rate change during low distress also predicted heart rate change in high distress. This consistency in response patterns across different levels of distress was found in all experimental groups and suggests that systolic blood pressure and heart rate respond to psychosocial stimulation in a non-specific manner;

i.e., systolic blood pressure and heart rate increase significantly during psychosocial distress experiences but there appears to be no gradient of distress in systolic pressure and heart rate change magnitude. Diastolic blood pressure changes, in contrast, were found to vary in response to the level of perceived distress and, therefore, appear to reflect a certain type of situation-specificity.

The finding of a pronounced repressive-defensive cognitive style in untreated hypertensives may have ramifications for personality research in hypertension. Several discrepancies and contradictions have characterized this research (see Gutman and Benson, (1971), and Linden and Feuerstein, (1981). These may well be due to response bias. Repressive-defensive response bias, however, has typically not been considered in previous personality studies. It appears that the hypertensives' cognitive style carries a trait character which, by its very nature, tends to invalidate the assessment of some personality aspects (particularly the assessment of abnormal, psychoneurotic characteristics) through means of self-report. Furthermore, it is interesting to note that the concept of repressive-defensiveness phenomenologically represents a withholding of emotion which will lead dynamically oriented investigators to assume suppressed conflicts (anger/hostility) while those favoring a behavioral framework will label the non-expression of emotion an aspect of low assertiveness. Both the suppressed hostility hypothesis (Alexander, 1939) and the lack of social competence hypothesis (Linden and Feuerstein, 1981) assume that it is maladaptive to withhold or repress emotions. This assumption, however,

may be premature. In fact, the present findings suggest that interpersonal interactions that require assertion and the expression of emotion tend to elicit a blood pressure hyperresponse in hypertensives, thereby exacerbating already elevated blood pressure levels. When, as the data suggest, a withholding/repressing of emotions is associated with an attenuation of diastolic pressure change, the repressive-defensive behavior pattern may in fact be adaptive by preventing further exacerbations of diastolic blood pressure.

The interaction of cognitive situation evaluations with physiological arousal indices in role-play assessments support earlier notions of questionable validity when role-play stimuli are chosen ad hoc and do not control for individual relevance and ability to identify with the prescribed role (Linden and Feuerstein, 1981; Spencer, 1978).

Data from the self-monitoring period in the present study further point to the existence of considerable intraindividual variation in what are considered to be minimally or highly distressing social interactions. Social distress appeared to be particularly frequent in spouse/family and work interactions. These observations concur with findings from a large scale normative sample of adult males and females investigating daily sources of stress (Pearlin and Schooler, 1978). Pearlin and Schooler reported that interpersonal strain was most frequent during interactions with family members and in the occupational setting.

The present study represents a first step in the direction of controlling the impact of stimulus relevance and, as such, holds promise for future

research on this issue. It remains to be determined, however, how closely the normative-ipsative assessment strategy as applied in the present study reflects completely naturalistic and individualized stimulus conditions outside of the laboratory. A validation could be executed by comparing psychological and physiological responses in-vivo with responses from a normative-ipsative assessment. It would be most interesting to determine in future studies whether better control of self-reported stimulus perception and impact in laboratory stress experiments might also lead to a decrease in the typically high inter-subject variability found on the physiological component of stress responses.

Implications for the investigation of trait and situational variables in hypertension research are also indicated. Recently, the consideration of situational variables has been emphasized, while trait conceptions are considered to be of limited value (Lazarus, 1978). The present findings suggest the importance of personality traits as they were found to be the best predictors of group membership in discriminant analyses. The addition of situation-specific physiological response patterns did not significantly contribute to the multiple prediction. The prediction of resting blood pressure levels by physical (age and weight) and physiological variables (diastolic pressure and heart rate, predicting systolic pressure, and systolic pressure and heart rate, predicting diastolic blood pressure) indicated that approximately 20% of variance in systolic and diastolic arterial pressure was accounted for by these factors. This finding is consistent with prior data (Stamler, et al., 1975). The addition of psychological

trait variables to the multiple regression equation increased the proportion of variability in resting systolic pressure accounted for by approximately 11%, bringing the total variance accounted for up to 33%. The same psychological variables accounted for an additional 19% of variance in diastolic resting pressure, bringing the total variance accounted for up to 42%. These data underline the relative importance of psychological factors in essential hypertension.

While not the intent of the present study, these results have implication for research on the pharmacological management of hypertension. These implications are particularly interesting as studies of drug treatment effects have primarily examined the impact of drugs on resting pressure values and response to physical stress (cf. Wilcox, 1978). The psychological effects of individuals undergoing drug treatment have not yet been systematically investigated. Given the relatively small subject samples and the variation in drug treatments among the experimental subjects, discussion of this issue must remain speculative. Further studies are necessary in which the drug and dosage are carefully controlled for. The present findings suggest some similarities and some differences between treated and untreated hypertensives. Despite the ongoing treatment and the lower resting blood pressure, the treated hypertensives displayed the same systolic hyperresponse to psychosocial distress as did untreated hypertensive subjects, suggesting that medication is most effective in lowering tonic responses. Optimal treatment might therefore require additional interventions to modify the

blood pressure response to environmental stress. Potential psychological effects of anti-hypertensive treatment were most clearly indicated by the absence of a pronounced repressive-defensive style in treated hypertensives. Psychophysiologically, treated hypertensives more closely resembled normal blood pressure controls than the untreated hypertensives, in that they displayed the predicted diastolic blood pressure elevations during low and high distress, whereas the untreated hypertensives responded differentially. These observations suggest the importance of investigations of the psychological effects of anti-hypertensive drug treatment.

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APPENDICES

Appendix A

Spouse/Family (SF)

SF - A

It has become a habit that you and your spouse/partner go and see her family three times a week. Now, however, you feel that it's too often and that you would like to have more time to follow other interests of yours. You tell your spouse that from now on you will not go more often than once a week.

SF - B

You really love your parents; however, since you have been a child you have never been able to directly tell them so. There is a wedding anniversary of your parents coming up and you have decided to use this occasion to tell your parents that you love them.

SF - C

You have not followed up on a hobby of yours (such as hunting, sailing, or skiing) because your partner doesn't like it. Now you have been invited to join a group for a one-week hobby-related vacation. You tell your partner that you want to accept this offer and go alone and that you had missed it long enough. Your partner doesn't want you to go.

SF - D

Usually there is an "all family" meeting at your parents' house every Sunday afternoon. One day you absolutely don't feel like going and call to cancel. You claim you are not feeling well.

SF - E

You lost $50 while shopping. A pick-pocket took it. It is fairly obvious that you haven't taken very much care. You come home and explain this situation and your spouse/partner is very critical and complains. You finally cut it off and say: "Please leave me alone now; it was already painful enough".

Appendix A

Work (WO)

WO - A

Your supervisor or boss asks you to do an additional job that demands a lot of time. You feel it is not really your responsibility, that it was someone else's who was fired three months ago but the position has not been filled again. You already have a heavy workload and you don't want to take on this added work. You clearly refuse the request.

WO - B

You go to your boss because you want to complain about the working conditions. People are smoking where they shouldn't be and it's much, much too loud. Your boss doesn't like the idea of changing anything and more or less refuses to do so. Now you insist that something be done.

WO - C

You would like to make a suggestion for improvement or change to your boss. You walk in his/her office and say: "I have a suggestion how we could work more effectively (or how we could do our work in an easier way"). You sit down and explain in detail your plan.

WO - D

You have a colleague who is always trying to get his/her work done by somebody else. One day he/she comes again and asks you to do something for him/her. You finally say: "I cannot and will not do that anymore." Your colleague gets angry and accuses you: "You are not fair; you are creating a rotten work atmosphere here ..." and on and on. You repeat your definite refusal.

WO - E

At work you ask a colleague whom you know really well to take over your work for 15 minutes because you have to go somewhere on private business. You know that your colleague will agree.

Appendix A

Strangers (ST)

ST - A

You were driving too fast; a police officer stops you and wants to give you a ticket. You feel that it was no more than 5 miles per hour over the speed limit and you try to talk him out of the ticket. The officer doesn't want to change his mind and you must pay. Nevertheless, you ask him for his identification because you want to verify that he is actually allowed to give you a ticket.

ST - B

You bought yourself a pair of pants. When you get home, you see that there is a large spot on them. The next day you return to the store to exchange the pants. You explain the situation but the salesman expresses doubts that the spot was there when the pants were bought. He requests proof that you bought them in this store. Finally, you request to talk to the supervisor.

ST - C

You paid for a reserved seat because you are going to take a long ride on the train. When you arrive your seat is taken and there is absolutely no other seat on the train. The person does not want to leave; you get in an argument and finally you have to call for the conductor.

ST - D

You are waiting at a bus stop, or sitting in a cafeteria, and you start a conversation (small talk) with a person of the same sex.

ST - E

You find yourself placed in the wrong tax category and you realize you have overpaid. A written request to change this situation was refused without a clear reason. To clarify the problem, you took all the necessary papers to the appropriate government office to convince the tax officer that you are right. Behind you a long line forms, the officer gets more and more unfriendly. Nothing helps and finally you ask for his/her supervisor.

Appendix A

Friends/Acquaintances (FA)

FA - A

You are in a conversation with a group of people. A friend of yours, whom you really like, makes a comment that you consider very prejudiced. Instead of trying to please your friend, you present your own opinion which is clearly contradictory.

FA - B

It is midnight and your neighbor is having a very loud party. You go to complain and ask them to turn down their stereo volume. After half an hour nothing has changed. You complain again; you are very angry by now and insist that the music be turned down. You stay at the door until they really do so.

FA - C

A friend who has a tendency to borrow a lot of things without returning them asks you for $20. You, however, refuse this very clearly and insist that he or she return the other money that he/she still owes you.

FA - D

You organized a little party because it was your birthday. You received a nice gift from a friend which you did not expect at all. You show how thankful you are and express your gratitude.

FA - E

You would like to be critical with a very good friend. This friend, for example, has a distasteful odour and he/she seems not to be aware of it. You say something like: "I am somewhat irritated by your smell. I want to tell you so that you will not be told by anybody else, or be rejected by somebody without them telling you why."

Consent Form

I, ..., freely and voluntarily consent to be a participant in the research project, entitled "Social Interactions and Blood Pressure Reactivity", to be conducted in the Department of Psychology of McGill University and the Herzl Family Practice of the Jewish General Hospital with Wolfgang Linden, Dipl.-Psych. and John Davine, M.D. as principal investigators.

The procedure to be followed and their purpose have been explained to me. I realize the study will extend over 3 - 4 weeks, after which I may participate in a relaxation training program of approx. 8 sessions which is offered to me free of cost.

The specific time involvement for each aspect of the study is as follows:

1) Completion of psychological tests and blood pressure measurement in the Psychology Department of McGill (2 hours)
2) Monitoring of stressful social interactions, approx. 5 min/day (2 weeks)
3) Evaluating physiological reactions during short role-play scenes in the laboratory at McGill University (1 hour)
4) Relaxation training at Herzl Family Practice (if I decide to partake), approx. 8 sessions of 45 minutes each.

During the laboratory test, my blood pressure and heart-rate will be recorded through a cuff placed on my upper arm and sensor placed on my earlobe. This recording does not interfere with normal functioning and does not create any pain.

Any benefits reasonably to be expected from my participation have been explained to me and are as follows:

1) detailed feedback on my test results and explanation how I tend to cope in interpersonal stress situations.
2) training in relaxation techniques such that I will be able to apply them later on my own.
3) contribution of information to advance the scientific understanding of blood pressure reactivity and psychosocial factors.

I realize that all information obtained is strictly confidential. While findings may be published in scientific journals, there will be no identification of me personally in any of these papers; all information will be reported exclusively in group form and will remain strictly anonymous.

I have the right to ask and receive answers on any inquiry concerning the foregoing. Questions, if any, have been answered to my satisfaction. I understand that this consent and data collected on me may be withdrawn at any time without prejudice. I have read and understood the foregoing.

Witness

Research Participant

SAD

Please answer the following questions with either a sign in the "true" column when you think that this statement applies to you. Mark a sign under "false" when you feel it does not apply to you. When neither a "false" nor a "true" appears to be totally correct for you, please still try to mark the one category that comes the closest to how you see yourself.

		True	False
1.	I feel relaxed even in unfamiliar social situations.	____	____
2.	I try to avoid situations which force me to be very sociable.	____	____
3.	It is easy for me to relax when I am with strangers.	____	____
4.	I have no particular desire to avoid people.	____	____
5.	I often find social occasions upsetting.	____	____
6.	I usually feel calm and comfortable at social occasions.	____	____
7.	I am usually at ease when talking to someone of the opposite sex.	____	____
8.	I try to avoid talking to people unless I know them well.	____	____
9.	If the chance comes to meet new people, I often take it.	____	____
10.	I often feel nervous or tense in casual get-togethers in which both sexes are present.	____	____
11.	I am usually nervous with people unless I know them well.	____	____
12.	I usually feel relaxed when I am with a group of people.	____	____
13.	I often want to get away from people.	____	____
14.	I usually feel uncomfortable when I am in a group of people I do not know.	____	____
15.	I usually feel relaxed when I meet someone for the first time.	____	____
16.	Being introduced to people makes me tense and nervous.	____	____
17.	Even though a room is full of strangers, I may enter it anyway.	____	____
18.	I would avoid walking up and joining a large group of people.	____	____
19.	When my superiors want to talk to me, I talk willingly.	____	____
20.	I often feel on edge when I am with a group of people.	____	____
21.	I tend to withdraw from people.	____	____
22.	I don't mind talking to people at parties or social gatherings.	____	____
23.	I am seldom at ease in a large group of people.	____	____
24.	I often think up excuses in order to avoid social engagements.	____	____
25.	I sometimes take the responsibility for introducing people to each other.	____	____
26.	I try to avoid formal social occasions.	____	____
27.	I usually go to whatever social engagements I have.	____	____
28.	I find it easy to relax with other people.	____	____

Appendix B

SELF-EVALUATION QUESTIONNAIRE

STAI FORM X-2

NAME _____ DATE _____

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you *generally* feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

	ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS
21. I feel pleasant	①	②	③	④
22. I tire quickly	①	②	③	④
23. I feel like crying	①	②	③	④
24. I wish I could be as happy as others seem to be	①	②	③	④
25. I am losing out on things because I can't make up my mind soon enough	①	②	③	④
26. I feel rested	①	②	③	④
27. I am "calm, cool, and collected"	①	②	③	④
28. I feel that difficulties are piling up so that I cannot overcome them	①	②	③	④
29. I worry too much over something that really doesn't matter	①	②	③	④
30. I am happy	①	②	③	④
31. I am inclined to take things hard	①	②	③	④
32. I lack self-confidence	①	②	③	④
33. I feel secure	①	②	③	④
34. I try to avoid facing a crisis or difficulty	①	②	③	④
35. I feel blue	①	②	③	④
36. I am content	①	②	③	④
37. Some unimportant thought runs through my mind and bothers me	①	②	③	④
38. I take disappointments so keenly that I can't put them out of my mind	①	②	③	④
39. I am a steady person	①	②	③	④
40. I get in a state of tension or turmoil as I think over my recent concerns and interests	①	②	③	④

Appendix B

Instructions to the Beck Inventory

On this questionnaire are groups of statements. Please read each group of statements carefully. Then pick out the one statement in each group which best describes the way you have been feeling the PAST WEEK, INCLUDING TODAY! Circle the number beside the statement you picked. If several statements in the group seem to apply equally well, circle each one. Be sure to read all the statements in each group before making your choice.

Rev. 10/73

BECK INVENTORY

Case Number: Name_____

1 2 3 4 5 5/6 Date_____

7 ( ) 0 I do not feel sad.
1 I feel sad.
2 I am sad all the time and I can't snap out of it.
3 I am so sad or unhappy that I can't stand it.

8 ( ) 0 I am not particularly discouraged about the future.
1 I feel discouraged about the future.
2 I feel I have nothing to look forward to.
3 I feel that the future is hopeless and that things cannot improve.

9 ( ) 0 I do not feel like a failure.
1 I feel I have failed more than the average person.
2 As I look back on my life, all I can see is a lot of failures.
3 I feel I am a complete failure as a person.

10 ( ) 0 I get as much satisfaction out of things as I used to.
1 I don't enjoy things the way I used to.
2 I don't get real satisfaction out of anything anymore.
3 I am dissatisfied or bored with everything.

11 ( ) 0 I don't feel particularly guilty.
1 I feel guilty a good part of the time.
2 I feel quite guilty most of the time.
3 I feel guilty all of the time.

12 ( ) 0 I don't feel I am being punished.
1 I feel I may be punished.
2 I expect to be punished.
3 I feel I am being punished.

13 ( ) 0 I don't feel disappointed in myself.
1 I am disappointed in myself.
2 I am disgusted with myself.
3 I hate myself.

14 ( ) 0 I don't feel I am any worse than anybody else.
1 I am critical of myself for my weaknesses or mistakes.
2 I blame myself all the time for my faults.
3 I blame myself for everything bad that happens.

15 ( ) 0 I don't have any thoughts of killing myself.
1 I have thoughts of killing myself, but I would not carry them out.
2 I would like to kill myself.
3 I would kill myself if I had the chance.

16 ( ) 0 I don't cry anymore than usual.
1 I cry more now than I used to.
2 I cry all the time now.
3 I used to be able to cry, but now I can't cry even though I want to.

17 ( ) 0 I am no more irritated now than I ever am.
1 I get annoyed or irritated more easily than I used to.
2 I feel irritated all the time now.

Appendix B

18 ( ) 0 I have not lost interest in other people.
1 I am less interested in other people than I used to be.
2 I have lost most of my interest in other people.
3 I have lost all of my interest in other people.

19 ( ) 0 I make decisions about as well as I ever could.
1 I put off making decisions more than I used to.
2 I have greater difficulty in making decisions than before.
3 I can't make decisions at all anymore.

20 ( ) 0 I don't feel I look any worse than I used to.
1 I am worried that I am looking old or unattractive.
2 I feel that there are permanent changes in my appearance that make me look unattractive.
3 I believe that I look ugly.

21 ( ) 0 I can work about as well as before.
1 It takes an extra effort to get started at doing something.
2 I have to push myself very hard to do anything.
3 I can't do any work at all.

22 ( ) 0 I can sleep as well as usual.
1 I don't sleep as well as I used to.
2 I wake up 1-2 hours earlier than usual and find it hard to get back to sleep.
3 I wake up several hours earlier than I used to and cannot get back to sleep.

23 ( ) 0 I don't get more tired than usual.
1 I get tired more easily than I used to.
2 I get tired from doing almost anything.
3 I am too tired to do anything.

24 ( ) 0 My appetite is no worse than usual.
1 My appetite is not as good as it used to be.
2 My appetite is much worse now.
3 I have no appetite at all anymore.

25 ( ) 0 I haven't lost much weight, if any, lately.
1 I have lost more than 5 pounds.
2 I have lost more than 10 pounds.
3 I have lost more than 15 pounds.

I am purposely trying to lose weight by eating less. Yes___No___

26 ( ) 0 I am no more worried about my health than usual.
1 I am worried about physical problems such as aches and pains; or upset stomach; or constipation.
2 I am very worried about physical problems and it's hard to think of much else.
3 I am so worried about my physical problems, that I cannot think about anything else.

27 ( ) 0 I have not noticed any recent change in my interest in sex.
1 I am less interested in sex than I used to be.
2 I am much less interested in sex now.
3 I have lost interest in sex completely.

_____
Time elapsed since clinical interview.

IPK

INSTRUCTIONS

You certainly realized that sometimes you talk with yourself, either in your mind or through spontaneous expressions. Everybody does so, and there is absolutely nothing unusual about it.

Below and on the following page you'll find a variety of such statements that people use to express their feelings in different situations. Please read these expressions carefully and mark how frequently you use such a statement to describe yourself.

Don't spend too much time on each item, simply mark the answer that describes you best.

Example: "It's going to be o.k."

If you think that you use this statement frequently please note it in the respective column.

Be generous, if the statement is not perfectly matched with the way you usually think and talk, please mark how frequently you might use a comparable expression.

Please Begin Here:	Cross (X) the appropriate circle hardly ever	rarely	sometimes	frequently
1. "it's going to be o.k.!"	0	0	0	0
2. "I feel great today!"	0	0	0	0
3. "it always happens to me!"	0	0	0	0
4. "I can handle that!"	0	0	0	0
5. "again, I didn't get anything done!"	0	0	0	0
6. "whatever I do, is wrong!"	0	0	0	0
7. "that's just the way I wanted it!"	0	0	0	0
8. "I know I'm not going to 'make it'!"	0	0	0	0
9. "I feel down!"	0	0	0	0
10. "great, that really worked out well!"	0	0	0	0
11. "I never felt as good as I have today!"	0	0	0	0
12. "with me, it doesn't work!"	0	0	0	0

	hardly ever	rarely	some-times	frequently
13. "boy, am I ever dumb !"	0	0	0	0
14. "I'm going to make it!"	0	0	0	0
15. "I feel rotten !"	0	0	0	0
16. "the way I did it was just great !"	0	0	0	0
17. "now I'm happy"	0	0	0	0
18. "you are never going to make it !"	0	0	0	0
19. "that worked out just fine!"	0	0	0	0
20. "that makes me feel good !"	0	0	0	0
21. "you manage to break everything !"	0	0	0	0
22. "I'm in a <u>great</u> mood !"	0	0	0	0
23. "all this makes me sick!"	0	0	0	0
24. "you couldn't have done it any better!"	0	0	0	0
25. "look, how I manged that one !"	0	0	0	0
26. "do I ever feel good !"	0	0	0	0
27. "you start a lot of things but never finish them !"	0	0	0	0
28. "I can't stand it any more !"	0	0	0	0
29. "everything fell right into place, just the way it was supposed to !"	0	0	0	0
30. "it's not all that bad !"	0	0	0	0
31. "I can't do that !"	0	0	0	0
32."I could embrace the whole world !"	0	0	0	0
33. "I'm a dummy !"	0	0	0	0
34. "I feel so miserable !"	0	0	0	0
35. "that worked a lot better than the last time !"	0	0	0	0
36. "I'm never lucky !"	0	0	0	0
37. "it won't be all that bad !"	0	0	0	0
38."I feel lousy !"	0	0	0	0

S D S

Listed below are a number of statements concerning personal attitudes and behaviors. Read each item and decide whether the statement is true or false as it pertains to you personally.

		True	False
1.	Before voting I thoroughly investigate the qualifications of all candidates.	__	__
2.	I never hesitate to go out of my way to help someone in trouble.	__	__
3.	It is sometimes hard for me to go on with my work if I am not encouraged.	__	__
4.	I have never intensely disliked anyone.	__	__
5.	On occasion I have had doubts about my ability to succeed in life.	__	__
6.	I sometimes feel resentful when I don't get my way.	__	__
7.	I am always careful about my manner of dress.	__	__
8.	My table manners at home are as good as when I eat in a restaurant.	__	__
9.	If I could get into a movie without paying for it and be sure I was not seen, I would probably do it.	__	__
10.	On a few occasions, I have given up doing something because I thought too little of my ability.	__	__
11.	I like to gossip at times.	__	__
12.	There have been times when I felt like rebelling against people in authority even though I knew they were right.	__	__
13.	No matter who I'm talking to, I'm always a good listener.	__	__
14.	I can remember "playing sick" to get out of something.	__	__
15.	There have been occasions when I took advantage of someone.	__	__
16.	I'm always willing to admit it when a make a mistake.	__	__
17.	I always try to practice what I preach.	__	__

	True	False
18. I don't find it particularly difficult to get along with loud mouthed, obnoxious people.	___	___
19. I sometimes try to get even, rather than forgive and forget.	___	___
20. When I don't know something I don't at all mind admitting it .	___	___
21. I am always courteous, even to people who are disagreeable.	___	___
22. At times I have really insisted on having things my own way.	___	___
23. There have been occasions where I felt like smashing things.	___	___
24. I would never think of letting someone else be punished for my wrongdoings.	___	___
25. I never resent being asked to return a favor.	___	___
26. I have never been irked when people expressed ideas very different from my own .	___	___
27. I never make a long trip without checking the safety of my car.	___	___
28. There have been times where I was quite jealous of the good fortune of others.	___	___
29. I have almost never felt the urge to tell someone off.	___	___
30. I am sometimes irritated by people who ask favors of me .	___	___
31. I have never felt that I was punished without a cause.	___	___
32. I sometimes think when people have misfortunes they only got what they deserved.	___	___
33. I have never deliberately said something that hurt someome's feelings .	___	___

R O S S - Instructions -

Enclosed you find 4 little packs with 5 paper clippings each. On each strip of paper there is a description of a social situation representing interactions with friends, strangers, colleagues at work, and family members. These situations imply different levels of "difficulty" or "stressfulness". When you imagine yourself in these situations you may find some of them rather easy to handle, while others might appear quite distressing and hard to cope with. How "easy" or "difficult" these situations appear to you is exactly what we want to find out.

Step 1

Please take any one of the four packs and read carefully the 5 situations described. Imagine yourself in this situation and decide how difficult or distressing it might be for you to handle these situations. Arrange the clippings in a column with the "easiest" scene on top and the most "difficult" one at the bottom. Now, note on the recording form (next page, under step 1) how you ordered the papers. An example might be WO -C,WO-D,WO-A,WO-E,WO-B . Then please continue by reading the instructions for step 2 .

Step 2

Imagine a scale from 1 - 200 where a score of "1" represents a situation that you consider not distressing or difficult at all, while a higher score indicates that coping becomes more and more difficult.

1	200
not distressing at all	the "worst" situation ever possible

In order to give a meaning to these numbers an arbitrary "difficulty/distress" score of 100 was given to the following situation:

> You are married or living with somebody, and you met somebody else and fell in love with this person. You now have to tell your spouse/partner that you want to move out and separate for a 3-month trial period. Your spouse is very hurt.

Possibly, you'll find all the situations on the paper clippings less stressful than the above. In this case you only give scores between 1 and 100 .Please assign one score to each situation and note them on the recording sheet (under step 2) . Repeat this same procedure for the remaining three (3) packs.

Appendix B

Recording Form ROSS

Order	Step 1 Situation (fill in letters A,B,C,D,E in your order)	Step 2 "Difficulty" score
1st(easy)	S F -	____
2nd	S F -	____
3rd	S F -	____
4th	S F -	____
5th(difficult)	S F -	____
1st(easy)	W O -	____
2nd	W O -	____
3rd	W O -	____
4th	W O -	____
5th(difficult)	W O -	____
1st(easy)	S T -	____
2nd	S T -	____
3rd	S T -	____
4th	S T -	____
5th(difficult)	S T -	____
1st(easy)	F A -	____
2nd	F A -	____
3rd	F A -	____
4th	F A -	____
5th(difficult)	F A -	____

Recording of Stressful Social Situations

Instructions

For a period of two weeks please record all social situations that you encounter and that make you upset,angry,furious,anxious, or just generally feel bad. Very often you can recognize these situations by signs your body gives: a heavy or unusual feeling in your stomach, your heart racing, or your breath becoming short and irregular. Please also watch out for moments when you anticipate problematic,upsetting situations with others (for example a potential conflict with your boss who will come back from vacation next week). If the idea of experiencing this situation is sufficient to get you upset or somewhat anxious you should record these situations as well.

For the recording procedure itself please use the recording forms provided. You will not have to write in detail how you perceived a situation but rather use a coding system which is explained below.

First we want you to monitor the number of these distressing events, i.e.,for each time such a stressful social situation occurs one number code should appear on the recording forms.

Secondly please identify the kind of relationship you have with the person with whom the stressful moment occurs. We provide separate columns on the forms for your interactions with 1) your spouse and other members of the family; 2) friends and acquaintances; 3) supervisors, peers and/or subordinates at work; 4) strangers (f.ex. on the street, in stores, governmental institutions etc).

Third please rate the degree of distress, upset or anxiety which you experienced in response to the actual or imagined situation. Keep in mind a scale from 1 to 9 where a rating of '1' indicates a mildly upsetting situation, while a score of '9' indicates an extremely upsetting event.

1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9
minimal distress extreme distress

Below is an example of what your recording for one day may look like:

Example	DAY 1
Spouse/Family	2 , 3 , 6
Friends/Acq.	2
At work	4 , 1
Strangers	8

Above we see that the person had a total of 7 upsetting events during this first day of recording. Three times s/he faced difficulties with a spouse or family member; twice (rated 2 and 3 on the distress scale) the situations had relatively mild effects, the third event (rated 6) was moderatley upsetting. One mildly (rated 2) distressing situation concerned a friend, twice s/he faced problems in the work situation, one moderately (4), the other one very minimally (1) upsetting. Apparently, another very upsetting encounter (rated 8) happened with a stranger.

Should there be a distressing atmosphere with your social partner/s that persists for more than one day (instead of a time-limited, concrete, problematic event) you record it for each day that it persists. It is possible that you may have to record this event over the entire 2-week period. Given that it is on your mind frequently and/or for a long time each, you will give it a relatively high distress rating because of this intensity.

As you could see in the example, once you have familiarized yourself with the recording forms and categories the recording can be done quite rapidly and simply .

DAY ____

For each event please record a number in the respective category below.

Spouse, Family	
At Work	
Strangers	
Friends, Acquaint.	

Rating of Behavior in Social Situations (RBSS)

Client name or number : side of tape : rater : date:

Please complete the following form concerning the client's social approach behavior during the taped role-plays. Use only the information given in the role-plays. Do not use other information even if you have seen the person before. To make the rating place a tick in the appropriate column (1 out of 5). If you feel that the role-plays do not give you specific information for one of the following behaviors please tick the column in the middle ("Inclines to neither A or B").

A	A applies	Inclines to A	Inclines to neither A or B	Inclines to B	B applies	B
1) No delay in reply to questions						Very slow in reply to questions
2) Tone of voice appropriate (speaks up when necessary, softly when necessary)						Tone of Voice inappropriate (too soft or too loud at the wrong times
3) Receptive to others, listens and pays attention						Does not pay attention what others say
4) Talks appropriately about personal feelings						Never talks about personal feelings
5) Waits to speak appropriately						Often interrupts
6) Talks spontaneously						Does not initiate talking
7) Can talk about a number of different subjects						Conversation limited to only one or two subjects
8) Argues appropriately (not aggressive or timid)						Argues aggressively
9) Gives full answers in reply						Gives very short answers in reply
10) Not excessively preoccupied with self						Excessively preoccupied with self
11) Speaks up for himself, can be assertive						Does not speak up for himself, very unassertive
12) Speech flows well						Speech hesitant, pauses, breaks

Total score :