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## PSYCHOLOGICAL ASPECTS OF HYPERTENSION

### I. The Influence of Experimental Interview Variables on Blood Pressure†

Many investigators have demonstrated that human blood pressure can be made to rise under the influence of various noxious or psychologically stressful stimuli. The role played by responses to such stimuli in the etiology of essential hypertension has been the subject of much intense speculation and research, most recently reviewed by S. Wolf, *et al.*<sup>1</sup> and Geiger and Scotch.<sup>2</sup>

A major problem in interpreting the results of such investigations has been the influence of the research situation itself. Stewart Wolf, *et al.*, using stress interviews tapping known areas of conflict in hypertensive subjects, induced significant BP increases.<sup>1</sup> The stimulus of a projective psychological test, namely the Thematic Apperception Test (TAT), has been found to produce BP rises, described by Weiner as dependent more upon the establishment of an "emotionally meaningful interaction" between the subject and the examiner than upon the content of the communication by the subject.<sup>3</sup> Varied stresses, such as thermal pain, rapid discrimination and mirror drawing have been associated with blood pressure rises.<sup>4</sup>

The nature of the subject's reaction to general aspects of the testing situation probably affects the degree of his physiological response to specific experimental stimuli. Reiser felt that the subject's expectations and the laboratory and the experimenter may in themselves play a significant role in affecting the physiological parameters, such as blood pressure, but they did not define these situational factors any further.<sup>5</sup> Other authors have attempted to characterize these nonspecific factors causing increases in blood pressure. Shapiro has suggested the presence of a non-specific "task stress" contributing to blood pressure rises in hypertensives in test situations involving TAT cards.<sup>6</sup> Similarly, Weiner noted the

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task "of communicating something to the examiner"<sup>8</sup> when a subject was asked to relate a TAT story.

As a first step in investigating psychological factors in hypertensive cardiovascular disease, we have attempted to define and vary certain types of test situation variables and to measure their physiological concomitants. We have combined two of the test situations that led to the above observations with a third and different task into a single experimental interview situation. We will examine, in a more systematic way than has previously been attempted, the comparative effect of these tasks on blood pressure in both hypertensive (B.P. > 140/90 on admission) and normotensive (B.P. < 140/90 on admission) patients. By understanding more clearly the influence of the test situation upon blood pressure, we will be able to assess more accurately the significance of interview content effects on blood pressure regulation.

#### METHOD

The experimental situation is an interview of approximately forty-five minutes' duration, conducted by the same person in every instance. It consists of an initial five-minute equilibration base-line period followed by three phases of varied interview content and structure and direction of the subject's attention. The sequence of phases in each interview was varied from subject to subject in a predetermined and randomized fashion.

One phase (WAT) involves a word association test, the subject being asked to give three responses to each of fifteen words—eight "neutral" and seven "charged," chosen according to the literature and theories of personality factors in hypertension<sup>7</sup> and our own pilot testing. (Appendix I.) In this phase, the interview is highly structured; the subject's attention is strongly directed outward—at the interviewer and the words; the content of the interview is rather impersonal.

Another phase (PD) consists of a fifteen-minute, moderately directive discussion of the patient's personal, social, family, and work history. In almost every interview, such questions as the following are asked in one way or another: "What brings you to the hospital?"; "How do you get along . . . with friends . . . at work . . . with your family?"; "Are there any things that bother or irritate you?" This PD phase is quite the opposite of the WAT phase in terms of the interview variables being studied. It is minimally structured; the subject's attention is focused on himself; the phase content concerns the subject's thoughts, feelings, and actions.

The third phase (TAT) consists of the presentation of six Thematic Apperception Test cards: 1, 6BM or 6GF, 7BM or 7GF, 8BM, 18GF,

18BM<sup>a</sup> (Appendix II). A two-minute response period is allowed for each card after the following instructions are given :

I am now going to show you some pictures. I want you to make up as dramatic a story as possible about what you see in each card. In your stories you should tell what is going on in the picture at the present time, what the person or people in the picture are thinking, what might have led up to this, and what the outcome might be. In other words, you will tell a story with a beginning, a middle, and an end.

This TAT phase is intermediate to the WAT and PD phases in terms of the degree of structure. The personal nature of the content and the direction of the subject's attention, whether inward to himself or outward to the card and story, depends upon the subject.

The entire session is tape recorded for subsequent content analysis and correlation with the physiological parameters. The Goddart "Haemotonomograph" (Instrumentation Associates, New York City) is used to measure the systolic and diastolic blood pressures automatically at one-minute intervals. An arm pressure cuff with two independent air pressure chambers is automatically inflated by the machine at one-minute intervals. As the air is released, the systolic reading is recorded as that pressure at which the first pulsations pass both pressure chambers. The diastolic reading is recorded as that pressure at which turbulence due to the pressure in the chambers disappears. Values obtained with this machine were found to be reliable by comparison with simultaneous measurements by the standard auscultatory method. These values are instantly recorded by means of a Renkin Denshi "Speedex X Y Recorder" on paper moving at a speed of 10 mm/min. The Goddart instrument also monitors the pulse continuously by means of a photo-electric cell attached to a finger, and the pulse rate is noted and recorded manually at the time of each reading of systolic blood pressure.

The equipment was set up in the patient's hospital room and, except in two instances, the subject was sitting in an arm chair. It has been found necessary to tie down the hand of the arm to which the cuff is attached in order to prevent errors in systolic readings caused by arm movements.

The affect content of the PD phase is scored by means of the Kehoe-Ironsides rating scale, which has been proven to yield satisfactory interjudge agreement in the subject population being studied (complete agreement on 63 per cent of 290 decisions on 4 point scale— $p < .01$  by chi square).

## RESULTS

To date, we have tested eight hypertensive and ten normotensive patients on the medical wards of Yale-New Haven Hospital. In this preliminary report, which is primarily concerned with methodology, the major finding presented is that of significant differences in mean blood pressures observed in the three phases of the experimental situation. In Table 1, the mean diastolic pressure in each phase is compared with that in the other phases, for each subject. It can be seen that in 73 per cent of all patients, the mean diastolic blood pressure during the personal discussion (PD) phase was significantly higher ( $p < .01$ ) than that during the WAT phase; in 35 per cent the mean diastolic blood pressure during the TAT phase was significantly higher ( $p < .01$ ) than that during the WAT phase. Also, in 35 per cent of subjects, the mean diastolic blood pressure was significantly higher ( $p < .01$ ) in the PD phase than in the TAT phase. In no subject was the mean diastolic pressure during the WAT phase higher than that of the other phases.

There were fewer significant differences among the mean systolic pressures in the three phases. Figures for systolic pressure in the first few subjects had to be discarded because of the errors from arm movements corrected as noted previously. Arm movements seem to have no effect on diastolic readings.

In all normotensives the mean diastolic pressure during the TAT phase was never significantly higher than that during the PD phase, while in two of the hypertensives the mean diastolic pressure was significantly higher ( $p < .01$ ) in the TAT phase than in the PD phase.

## DISCUSSION

Our experimental situation was designed as a composite of three different types of interview, on the basis of incidental observations by others, and our own pilot studies. We feel that the diastolic blood pressure differences found among the phases indicate:

1. The automatic blood pressure recording technique we have described is sensitive enough to yield consistent significant results. Thus, this method satisfies a need mentioned by Maas and Engel.<sup>9</sup>

2. The experimental interview design described is useful for further investigation of the psychological aspects of hypertension.

We are now in a position to examine other subjects with this more carefully instrumented and controlled interview situation. Relationships between the physiological variables (diastolic and systolic blood pressure and pulse) and the psychological variables (affect scores during the PD

TABLE 1. PHASE DIFFERENCES IN MEAN DIASTOLIC BLOOD PRESSURES

Normotensive	$\bar{x}$ (SD)	PD (SD)	WAT (SD)	$\bar{x}$ (SD)	d $\bar{x}$	PD (SD)	WAT (SD)	$\bar{x}$ (SD)	d $\bar{x}$	PD (SD)	WAT (SD)	$\bar{x}$ (SD)	d $\bar{x}$
J. B.	82.5(8.1)	—	76.9(2.6)	—	5.6**	—	—	—	—	—	—	—	—
T. A.	91.2(4.8)	—	78.3(1.2)	—	12.9*	91.2(4.8)	—	96.7(10.0)	—5.5	96.7(10.0)	—	78.3(1.2)	18.4*
F. C.	95.5(5.8)	—	80.7(2.3)	—	14.8*	95.5(5.8)	—	85.5(3.2)	10.0*	85.5(3.2)	—	80.7(2.3)	4.8*
W. N.	85.1(5.7)	—	77.1(2.6)	—	8.0*	85.1(5.7)	—	84.7(3.0)	0.4	84.7(3.0)	—	77.1(2.6)	7.6*
D. W.	92.7(4.3)	—	88.1(4.2)	—	4.6*	92.7(4.3)	—	91.3(2.2)	1.4	91.3(2.2)	—	88.1(4.2)	3.2**
S. N.	86.6(3.0)	—	79.3(3.2)	—	7.3*	86.6(3.0)	—	85.8(6.0)	0.8	85.8(6.0)	—	79.3(3.2)	6.5*
L. M.	88.1(2.7)	—	83.1(2.8)	—	5.0*	88.1(2.7)	—	82.6(3.3)	5.5*	82.6(3.3)	—	83.1(2.8)	-0.5
S. A.	68.5(5.3)	—	65.1(2.3)	—	3.4**	68.5(5.3)	—	65.8(1.4)	2.7	65.8(1.4)	—	65.1(2.3)	0.7
W. A.	87.1(4.5)	—	80.1(2.2)	—	7.0*	87.1(4.5)	—	84.5(5.8)	2.6	84.5(5.8)	—	80.1(2.2)	4.4**
S. K.	89.1(10.0)	—	83.9(8.3)	—	5.2	89.1(10.0)	—	88.3(3.2)	0.8	88.3(3.2)	—	83.9(8.3)	4.4
Average	86.6	—	79.3	—	7.3	86.6	—	86.6	—	86.6	—	86.6	—
Hypertensives													
M. E.	102.9(2.4)	—	102.3(2.5)	—	0.6	102.9(2.4)	—	104.4(1.7)	-1.5	104.4(1.7)	—	102.3(2.5)	2.1**
F. C.	107.6(4.5)	—	90.3(2.4)	—	17.3*	107.6(4.5)	—	112.4(2.6)	-4.8*	112.4(2.6)	—	90.3(2.4)	22.1*
M. P.	98.0(7.3)	—	81.6(5.5)	—	16.4*	98.0(7.3)	—	85.6(6.1)	12.4*	85.6(6.1)	—	81.6(5.5)	4.0
A. H.	121.9(4.1)	—	112.7(2.7)	—	9.2*	121.9(4.1)	—	115.9(2.7)	6.0*	115.9(2.7)	—	112.7(2.7)	3.2**
A. D.	107.6(4.9)	—	98.4(4.3)	—	9.2*	107.6(4.9)	—	117.9(3.7)	-10.3*	117.9(3.7)	—	98.4(4.3)	19.5*
J. E.	91.5(3.4)	—	91.1(2.1)	—	0.4	91.5(3.4)	—	93.0(2.7)	-1.5	93.0(2.7)	—	91.1(2.1)	1.9
J. R.	109.7(8.0)	—	101.6(5.0)	—	8.1*	109.7(8.0)	—	98.5(5.8)	11.2*	98.5(5.8)	—	101.6(5.0)	-3.1
I. S.	113.7(5.0)	—	104.8(2.7)	—	8.9*	113.7(5.0)	—	106.0(1.6)	7.7*	106.0(1.6)	—	104.8(2.7)	1.2
Average	106.6	—	97.9	—	8.7	106.6	—	106.6	—	106.6	—	106.6	—

\* p < 0.01 t test.  
 \*\* p < 0.05 t test.  
 $\bar{x}$  = mean diastolic B.P. in mm Hg.  
 (SD) = standard deviation.  
 d $\bar{x}$  = difference between  $\bar{x}$ 's.  
 PD = Personal discussion phase.  
 WAT = Word association phase.  
 TAT = Thematic aperception test phase.

phase, the response times and degree of blocking during the WAT phase, and the aggressive content and emotional tone of the TAT stories) will be statistically analyzed, taking into consideration the possible effects exerted by the varying structure and direction of subject attention in each phase. Attempts will also be made to find psychological differentiations between subjects with essential hypertension and those with hypertension secondary to known organic factors.

#### SUMMARY

We have described a method for investigating psychological aspects of hypertension. This method consists of an interview with a controlled and systematically varied format, accompanied by concomitant measurement of systolic and diastolic blood pressure and pulse by automatic means. Significant differences in the mean diastolic blood pressures among the three interview phases were observed. The implications of these findings and an outline for further investigation are presented.

#### APPENDIX I

The words were used in the following order with every patient:

- |              |           |              |
|--------------|-----------|--------------|
| 1. table     | 6. play   | 11. nagging* |
| 2. book      | 7. sin*   | 12. fun      |
| 3. gangster* | 8. horse  | 13. mother*  |
| 4. road      | 9. dread* | 14. school   |
| 5. boss*     | 10. movie | 15. kill*    |

\* "charged"

During pilot testing prior to the present series of subjects, there were 28 words used—14 "charged" and 14 "neutral." The *change* in blood pressure after each word was measured and from these change values for each word for each subject, the mean change in blood pressure and the standard deviation was computed for each of the 28 words in all nine subjects. As a physiological criterion for a word being "charged" or "neutral" we then chose those eight words from the group hypothesized to be "neutral" which were associated with the smallest standard deviations in blood pressure change. From the 14 "charged" words we chose those associated with the largest standard deviations in blood pressure change. The instructions given to each subject for this test were as follows:

I am now going to call out to you a list of words. As I call out each word, I want you to say the first three words that come to your mind when I call out the word. I will be timing with this stop watch the time between my calling the word and the first word you say. This is just another measurement like the blood pressure and pulse.

## APPENDIX II

The cards are described by Henry<sup>30</sup> as follows:

- 1 — A young boy is contemplating a violin which rests on a table in front of him.
- 6BM — A short elderly woman stands with her back turned to a tall young man. The latter is looking downward with a perplexed expression.
- 6GF — A young woman sitting on the edge of a sofa looks back over her shoulder at an older man with a pipe in his mouth who seems to be addressing her.
- 7BM — A gray-haired man is looking at a younger man who is sullenly staring into space.
- 7GF — An older woman is sitting on a sofa close beside a girl, speaking or reading to her. The girl, who holds a doll in her lap, is looking away.
- 8BM — An adolescent boy looks straight out of the picture. The barrel of a *rifle* is visible at one side, and in the background is the dim scene of a surgical operation, like a reverie-image.
- 18GF — A woman has her hands squeezed around the throat of another woman whom she appears to be pushing backwards across the bannister of a stairway.
- 18BM — A man is clutched from behind by three hands. The figures of his antagonists are invisible.

For further details, see reference 10.

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