

## EDITORIAL

### Psychological aspects of high and low blood pressure<sup>1</sup>

Risk of disease often rises for subjects who lie at either end of the distribution of a physiological parameter. Blood pressure may be such a variable. In addition to the undoubted risk of serious physical disease, various psychological characteristics have been associated with hypertension. Only recently has the other end of the continuum been explored. Remarkably, the same symptoms once thought to be associated with high blood pressure, i.e. headaches, dizziness, tiredness, anxiety and depression are now being linked with low blood pressure. This review explores the evolution of these themes and attempts to explain the recent interest in hypotension.

#### HYPERTENSION

##### Stress and personality factors in hypertension

There is little doubt that acute stress can cause a transient rise in blood pressure both in animals (Henry *et al.*, 1967) and in man (Engel & Bickford, 1961). Other studies have shown that continued stress, such as prolonged noise, may lead to sustained hypertension (Jonsson & Hansson, 1977), and air traffic controllers, who are continually exposed to stress, are four times more likely to develop hypertension than age-matched controls in less stressful jobs (Cobb & Rose, 1973). There is considerable evidence that these stress-induced changes in blood pressure are mediated by increased sympathetic activity. Raised catecholamine levels have been reported for hypertensives both in plasma (DeChamplain *et al.* 1976) and in urine (Torgersen & Kringlen, 1971).

The early 'psychosomaticists' used psychoanalytic case-studies to argue for specific personality profiles in hypertensives. According to Alexander (1939), hypertensives have a characteristic psychosomatic structure consisting in a 'very profound conflict between passive, dependent, feminine, receptive tendencies and over-compensatory competitive, aggressive, hostile impulses'. He argues that the same conflict situation may find expression in different ways, and that essential hypertension develops when these impulses are not able to be drained away by other means such as through neurotic symptoms. Just as acute anger leads to a transient rise in blood pressure, 'a chronic inhibited rage may lead to a chronic elevation of the blood pressure'.

Some support for this derives from studies such as that by Hokansen *et al.* (1963) of college students, in which frustration of task completion by an experimenter was associated with a rise in systolic blood pressure. Subjects who were allowed to express aggression towards the frustrator showed a significantly greater reduction in systolic blood pressure than the controls whose aggression was expressed to a neutral object. Pilowsky *et al.* (1973) found that hypertensives had higher deference and self-abasement (hostility turned inwards) scores, and Whitehead *et al.* (1977) reported that hypertensives had higher anger scores. Baer *et al.* (1979) designed and validated a self-report instrument comparing hyper- and normotensives and found the former to be more hostile and anxious. Other traits that have been linked with high blood pressure include perfectionism, compulsiveness, and difficulty with authority (Binger *et al.* 1945), submissiveness (Torgersen & Kringlen, 1971), obsessive-compulsive behaviour (Saslow *et al.* 1950), and the Type A Behaviour Pattern (Ward *et al.* 1982). In all these studies, the patients knew that they were hypertensive, and feelings such as anger or hostility may therefore be a consequence rather than a cause of the hypertension. With newly diagnosed hyper- and normotensive subjects, no differences were found

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in either global (Wheatley *et al.* 1975), outwardly or indirectly directed (Cochrane, 1973; Mann, 1977a), or suppressed (Goldberg *et al.* 1980) hostility.

### Psychological symptoms and hypertension

Acute anxiety or fear can lead to a transient rise in blood pressure (Whitehead *et al.*, 1977), as can acute stress. The evidence for an association, causal or otherwise, between psychological symptoms and a sustained rise in blood pressure is less compelling. There are several reasons why neurotic symptoms may appear misleadingly to be associated with high blood pressure. First, neurotic individuals, especially if they suffer from symptoms such as headaches, are more likely to consult their GP, who may measure their blood pressure because of a believed association between hypertension and such symptoms (Stewart, 1953; *BMJ* 1976). Secondly, the additional presence of neurotic or other symptoms for any given level of blood pressure may increase the likelihood of the GP diagnosing hypertension and referring for specialist advice (Davies, 1970). Thirdly, knowledge that one is suffering from hypertension, a chronic and potentially life-threatening condition, may have a substantial effect on mental state (Monk, 1980), although this does not occur if these individuals are adequately counselled (Mann, 1977b, 1984). Fourthly, many studies report an association between some antihypertensive drugs and depression (Goldberg *et al.*, 1980) or related symptoms such as drowsiness or sleep disturbance (Raftos, 1969). Lastly, the importance of controlling for confounding variables is highlighted by a large and detailed study (Kottke *et al.* 1979) which showed that the correlation of 0.33 of blood pressure with confounding variables completely overshadowed even the strongest correlation between blood pressure and any supposedly associated physical or psychological symptom. Important variables are sex, age, body mass index, alcohol intake, social class, physical illness, exercise and medication. Studies which do not control for these variables must be interpreted with caution.

The belief that hypertension and psychological symptoms are closely related is still highly prevalent, yet the early studies, which claimed some support for this belief, are all deficient in one or more of the ways listed above. What is particularly striking is the number of studies specifically investigating the association between high blood pressure and psychological symptoms that accidentally find hypertension to be associated with fewer such symptoms.

Sainbury's work (1964) is the most cited evidence for an association between high blood pressure and psychological symptoms. He compared the Maudsley Personality Inventory (MPI) (Eysenck, 1959) scores of patients with a variety of 'psychosomatic' disorders, including 19 hypertensives, who had been referred by their general practitioners to an out-patient clinic, with 546 patients referred for other conditions. The hypertensives and those with other psychosomatic disorders had significantly higher neuroticism scores. Kidson (1973) compared 40 hypertensive out-patients with 110 subjects selected from an employed population, on 16-PF (Cattell & Eber, 1957), EPI (Eysenck & Eysenck, 1964) and Cornell Medical Index (CMI) (Brodman *et al.* 1949) scores. The hypertensives were significantly more neurotic than controls, and had higher CMI scores on several domains including depression and anxiety. When, however, he compared hypertensive and matched normotensive employed subjects who had no knowledge of their blood pressure, and were therefore not undergoing treatment, he found that the hypertensives had lower CMI scores. This serves to emphasize the difficulty of interpreting the results of studies relying solely on a comparison of patient cases with healthy controls. Robinson (1962) compared 43 hypertensive out-patients with 167 normal population controls and found the hypertensives to have significantly higher MPI neuroticism scores. Because of the possible bias that selective referral by the GP, and knowledge of hypertensive status may have introduced, the correlation between blood pressure and neurosis within the community sample was examined. Only in males aged 41–50 was there a significant correlation, though the authors concede that this result may be due to chance, given that the number of correlations was large and the number of subjects in this sample was small ( $N = 14$ ). Baer *et al.* (1979), using their own instrument, reported higher levels of anxiety in 332 essential hypertensives referred by a physician than in 335 normal population controls. A rather different approach (Rabkin *et al.*, 1983) involved a sample of 452 consecutively admitted psychiatric patients, of whom

66 identified themselves as having high blood pressure. DSM-III diagnoses were made blind to hypertensive status. In this study, 62% of the hypertensive and 25% of the non-hypertensive patients met criteria for current depressive disorder. However, not only were the hypertensive patients aware of their condition, but apart from sex, none of the potential confounders, including medication, were adequately controlled for.

In all the above studies, the patients knew that they were hypertensive; they had been selectively referred by their GP, and no account was taken of medication (including antihypertensive medicine). Furthermore, few of the confounding factors were controlled. Several of the studies compared hypertensive patients with normal population controls, and the sample sizes were mostly small. In general, those studies where the sample size is large, where more care is taken to control for confounding variables, and where subjects are ignorant of their blood pressure status before the psychological assessments are made, yield a different picture.

Mann (1977*a*) found no difference in the amount of psychiatric morbidity, as determined by the General Health Questionnaire (GHQ) (Goldberg, 1972), in 2388 hypertensives and 10305 normotensives participating in a screening trial for hypertension. In fact, although the authors do not comment on it, analysis of their tabulated data suggests that the hypertensives were less likely to be neurotic than the normotensives (47% and 77% respectively,  $P < 0.01$ ). Wheatley *et al.* (1975) found no excess of anxiety or depression, as measured by the Symptom Self-Rating Scale (Derogatis *et al.* 1974), or physicians' reports, in newly diagnosed hypertensives visiting their general practitioners compared with age and sex-matched normotensives. In a study of 640 participants in a screening program who were in treatment for hypertension (Goldberg *et al.*, 1980), there was no association between systolic blood pressure and either depression, measured by the CES-D (Radloff, 1977), or happiness measured by the Bradburn Balanced Happiness scale (Bradburn, 1969). The symptom, 'trouble getting to sleep', was however correlated negatively with blood pressure, i.e. persons with low systolic blood pressure were more likely to report trouble getting to sleep. Hodes & Rogers (1976) administered the GHQ to patients attending a screening clinic for hypertension before they were aware of their blood pressure. There was no difference in score between the 132 hypertensives and 195 normotensives. A similar result was found (Soghikian *et al.*, 1981) using an adapted version of the Cornell Medical Index in a large sample undergoing medical screening. Cochrane (1973) found no difference in EPI neuroticism scores in 32 hypertensive and 64 normotensive volunteers participating in a heart disease prevention trial, and Monk (1980) found no difference in general well-being scores for 2363 normotensives and 488 hypertensives in the Health and Nutritional Examination Survey (National Center for Health Statistics, 1973).

In a carefully conducted study, in which a large number of potentially confounding variables were taken into account (Davies, 1970), the resting blood pressure of all the 45–54-year-old males in a large workshop in a Birmingham car factory were measured. Prior to measurement of blood pressure, the 128 participants completed a questionnaire which included the EPI and several self-assessment questions designed by the author. There were significant associations between blood pressure and both EPI neuroticism scores, and self-rated anxiety and depression proneness, though unexpectedly they were in the direction of greater morbidity with lower blood pressure.

Other symptoms traditionally associated with hypertension include headaches, dizziness and tiredness (Riseman & Weiss, 1931; Bulpitt *et al.* 1976). Stewart (1953) compared the frequency of reported headaches in patients discovered to have severe hypertension, but of the 96 patients aware of their diagnosis, 74% reported headaches compared with only 16% of the 104 patients unaware of their diagnosis. In a study (Kottke *et al.* 1979) of 1926 individuals who had never been told they were hypertensive, and where a large number of confounding variables were controlled for, neither headaches nor dizziness were associated with hypertension. These studies suggest that the symptoms reported by hypertensive patients are not caused by the hypertension itself, but result from awareness of the condition.

## HYPOTENSION

Although, as we have seen, several studies investigating the psychological accompaniments of hypertension found the reverse association, the recent interest in the link between low blood pressure and psychological symptoms derives largely from the supposed existence of a hypotensive syndrome, widely diagnosed in several European countries.

The diagnosis of hypotension is frequently made in Germany where it is defined as a systolic blood pressure consistently below 100 mmHg, diastolic blood pressure being less important (Linss *et al.* 1986). Recommended treatments range from physical exercise and a high salt diet (Vosschulte *et al.* 1979), to peripheral vasoconstrictors such as dihydroergotamine and, in 'severe cases', sympathomimetic drugs (Schettler, 1976). Pemberton (1989) cites the Munich Blood Pressure study of 1980–1, where it was found that in a community sample, 1.8% of men and 5.8% of women age 30–69 were taking prescribed antihypotensive drugs. The condition is also widely diagnosed and treated in France, Italy and Spain. Outside Europe the diagnosis is less frequently made, though there are some exceptions. In a community screening program of 1019 individuals in Montreal (Robbins *et al.* 1982), 9.5% reported being treated for low blood pressure. An additional 14.8% had been diagnosed as hypotensive, though they were not receiving treatment. These subjects were volunteers responding to an advert for free blood pressure testing, and so the sample is likely to be strongly skewed to include more subjects with known abnormality of blood pressure.

At the beginning of this century, hypotension was recognized as a clinical entity in many English-speaking countries, including Britain and America, where it was associated with tiredness, dizziness and weakness (Friedlander, 1924; Dally, 1928). As evidence increased of the dangers of high blood pressure, and the cardio-protective effect of low blood pressure, there was a swing away from regarding hypotension as a disease.

More recently a series of studies examining specifically the relationship between low blood pressure and various physical and psychological symptoms lends more credibility to the existence of a hypotensive syndrome. Pemberton (1989) examined data from a national study (National Institute of Occupational Health and Safety Blood Pressure Study, 1987), in which blood pressure and several symptoms including dizziness, fainting and tiredness were included. He found that tiredness in women was significantly associated with low systolic and diastolic blood pressure. It is not clear why this association was not found for men, though it is worth noting that none of the potentially confounding variables identified earlier (including medication) had been controlled for. Bengtsson *et al.* (1992) found an increased prevalence of several symptoms in men and women with low blood pressure, including general fatigue, overexertion, dizziness and 'readiness to cry'. Although they did not specifically include any psychological measures, these symptoms strongly suggest the possibility of depression in the hypotensive subjects. An examination (Wessely *et al.* 1990) of data from the Health and Lifestyle Survey (Cox *et al.* 1987) found hypotension to be associated with both tiredness and feeling faint/dizzy. Several confounders were isolated and controlled for, including sex, age, taking of drugs, physical illness, exercise and body mass index. No association was found between GHQ score and blood pressure, though in this analysis they did not control for the above confounders, which may have obscured the relationship. In a similar study, of a cohort (Marmot *et al.* 1991) of 10314 civil servants, Pilgrim *et al.* (1992) found low systolic blood pressure to be associated with unexplained tiredness in men and women, and with dizziness/giddiness in men. The association of low blood pressure with depression, as measured by the GHQ, was even stronger, for both men and women. Indeed, when GHQ score was controlled for, the association of blood pressure with unexplained tiredness and dizziness/giddiness was no longer significant. In these analyses a large number of confounding variables were controlled for, including sex, age, marital status, employment grade, ethnic group, alcohol consumption, smoking, body mass index, level of exercise, physical illness, previous diagnosis of hypertension, and antihypertensive and antidepressant medication. Most recently, Rosengren *et al.* (1993) examined the relationship between systolic blood pressure and perceived well being in a random population sample of 776 middle-aged Swedish men. They found the men with low systolic blood pressure to

have significantly lower self-reported energy and self-confidence. In addition, they also had poorer appetite, memory and general health. Similar, though weaker, associations were found with diastolic blood pressure.

## CONCLUSION

The results of these studies, taken together with the accidental findings of many of the studies of hypertension referred to earlier, point to an association between low blood pressure and certain physical and psychological symptoms. This association is less surprising when seen in historical perspective.

At the beginning of the century in Britain and in continental Europe, hypotension was widely believed to be associated with a variety of symptoms, as outlined above. The work of the psychosomaticists in the 1920s and 1930s which was based on small, highly selected samples of patients, indeed often single case histories, was particularly influential in Britain and America. Because of the intuitive plausibility of the idea that repressed anger may cause high blood pressure, these ideas became widely accepted. They were reinforced by a handful of small studies comparing mostly hypertensive patients in treatment with normal population controls, which took no account of labelling, medication or other confounding variables, and not surprisingly found the hypertensives to be more neurotic than the controls. The more recent epidemiological studies of newly diagnosed hypertensives, employing multivariate analyses in which confounding variables were identified and controlled for, did not replicate these findings, and the researchers were often surprised to find the hypertensives to be less neurotic. The very recent large studies, in which the analyses have been directed specifically at an examination of low blood pressure, are unanimous in finding an excess of psychological and/or physical symptoms in those with low blood pressure, particularly the systolic component.

There are many plausible explanations for this association (Mann, 1992). It is possible that other confounding variables have not been identified. There may be a common cause for both, perhaps via central monoamine activity, which could conceivably give rise to both depression and low blood pressure. The existence of a 'hypotensive syndrome' is only one of many possible interpretations of these studies (Pilgrim & Crawford, 1993). It has been criticized further on the grounds that low blood pressure is not a disease because it is associated with greater life expectancy (Robbins *et al.* 1982), although it is responsible for a substantial number of lost working days in Germany (Beske *et al.* 1983). An alternative possibility accords with the psychosomaticists' claim that essential hypertension develops when neurotic symptoms that serve to 'drain away' pent-up hostile impulses are absent, so that these impulses become manifest instead in physical symptoms such as hypertension. If this was the case, hypertensives would indeed have fewer neurotic symptoms because their hostility would be channelled in the direction of physical rather than psychological symptoms.

A hypotensive syndrome implies that low blood pressure is the cause, in some individuals, of their neurotic, or other symptoms. Clearly, only with prospective studies and intervention trials can these questions of causality start to be addressed.

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