Person. individ. Diff. Vol. 4, No. 5, pp. 499–505, 1983
Printed in Great Britain.

0191-8869/83 $3.00 + 0.00

THE COMPONENTS OF TYPE A BEHAVIOUR AND ITS GENETIC DETERMINANTS

HANS EYSENCK and DAVID FULKER
Department of Psychology, Institute of Psychiatry, University of London, De Crespigny Park, Denmark Hill, London SE5 8AF, England

(*Received* 6 *December* 1982)

INTRODUCTION

The concept of Type A–Type B behaviour is well known; it describes a typology characterized by aggressiveness, ambition, competitiveness, time urgency, impatience, behavioural alertness and intense committment to vocational goals (Steptoe, 1981). There is some evidence that Type A behaviour is related to coronary heart disease (Friedman and Roseman, 1974), and it is this correlation, which is of course not always found, which has excited interest in the concept of Type A behaviour. There are, however, many criticisms that must be made of the typological hypothesis (Review Panel, 1981). The major objection is to the notion of typology altogether; practically all personality traits are normally distributed, and it seems unlikely that Type A behaviour could differ so fundamentally from all other personality traits (Eysenck, 1970). Statements that a certain percentage of a given population (varying usually from 50 to 70%) is of Type A are as meaningless as statements that a certain proportion of the population is tall; the implication of a U-shaped distribution, or even a categorical distinction between two 'types', is inherently improbable.

The second criticism relates to the very meaningfulness of the concept. It is accepted in psychology that concepts should not be put forward without good evidence that the pattern of intercorrelations implicit in the proposed trait or type is actually found; thus it may be that some of the alleged component traits of Type A do intercorrelate positively, while others may not. The factorial support for the concept is weak, and the decomposition into three major factors (Hard-driving Competitiveness; Job Involvement; Speed and Impatience) by Jenkins, Zyzanski and Roseman (1971) suggests that possibly certain aspects of Type A behaviour may be related to CHD, while others are not.

A third point relates to the neglect by workers in this field of the problem of the relationship between Type A behaviour and established dimensions of personality. Proponents of the concept often argue and write as if well-validated models of personality did not exist, and fail to relate their concepts to these dimensions (Eysenck, 1981a). Yet the description of Type A behaviour would seem to relate it closely to both E and N, and Rim (1981) has in fact shown that Bortner's rating scale (Bortner, 1969) correlates significantly with both E and N. Similar results have been reported by Lovallo and Pishkin (1980).

It is of interest that epidemiological and experimental studies (e.g. Slaby, Horwath and Frantik, 1981; Floderus, 1974) have shown that important differences in performance and illness, relevant to cardiovascular disorders, can be found when Type A subjects are subdivided into those high and low, respectively, on N; differences in N may be more important than Type A–Type B differences in relation to CHD. Floderus in fact suggests, and provides some evidence for the suggestion that angina pectoris, hypertension and tachycardia may be related to high N and I, while myocardial infarction and hyperlipidemia may be related to high N and E; the relation between E and myocardial infarction has been demonstrated by Bendien and Groen (1963). Many other studies (e.g. Baer, Collins, Bourianoff and Ketchel, 1979; Frankenhaeuser, Lundberg and Forsman, 1980; Innes, 1980; Jenkins, Zyzanski, Ryan, Flessas and Tannenbaum, 1977; and Nowack and Sasenrath, 1980) clearly indicate the relevance of N and E to the assessment of coronary-prone behavior.

The present study was designed to throw light on these various problems, as well as to answer certain questions regarding the genetic aspects of Type A behaviour. Previous studies (e.g.

Matthews and Krantz, 1976; Koskenvuo, Langinvainio, Kaprio, Rautasalo and Sarna, 1979), while demonstrating higher intraclass correlations for MZ twins than DZ twins on Type A–Type B questionnaires, had used methods of analysis which are not in line with modern genetic theories and practices (Mather and Jinks, 1971), and we proposed to look at the problem from the point of view of modern biometrical genetical analysis.

THE EXPERIMENT

For the purpose of this study, a new 34-item questionnaire was drawn up, based on the original hypotheses and later modifications of the originators of the concept of Type A behaviour and the various questionnaires designed and used by others, e.g. Jenkins, Bortner etc. This questionnaire was administered to 373 male and 709 female *S*s, with mean ages of 25 and 29 yr, respectively. All were members of the Maudsley Twin Register, which is described elsewhere (Eysenck, 1981b). All the twins had already filled in the EPQ, which gives scores for Neuroticism, Extraversion, Psychoticism and L, a Lie or Dissimulation scale which also measures conformity (Eysenck and Eysenck, 1975).

As a first step in the analysis, the 34 items of the Type A–Type B questionnaire were intercorrelated for males and females separately (phi coefficients), and the resulting matrices factor analysed using principal components. Four factors were extracted and rotated to oblique simple structure by means of the Promax programme. The resulting four factors were similar for males and females, and were labelled Tenseness, Ambition, Activity and Unrepressed. Table 1 shows the items loading on the first factor; Table 2 shows items for the second factor; Table 3 does the same for the third factor and Table 4 for the fourth. The fourth factor is less clear-cut than the others, and its interpretation is hazardous; the other three factors are fairly obvious.

Table 1. Items and factor loadings for Factor 1, Tenseness

1. Do you take things as they come, without getting too irritated?	YES	NO
2. Are you very keen that other people should know about it when you have done a good job on something?	YES	NO
3. Do you strongly need recognition and advancement at work?	YES	NO
4. Can you wait patiently without getting upset?	YES	NO
5. Do you take things as they come, rather than trying to do many things at once?	YES	NO
6. Are you a slow and calm talker?	YES	NO
7. Do things and people often make you angry?	YES	NO
8. Would you call yourself easy-going?	YES	NO
9. Does it irritate you a lot to be interrupted in your work?	YES	NO
10. Do you hate queuing or waiting in line?	YES	NO
11. Have you always been rather even-tempered?	YES	NO
12. Are you always in a hurry to get somewhere?	YES	NO
13. Do people consider you relaxed and easy going?	YES	NO
14. Are you often impatient and interrupt people who are slow at coming to the point?	YES	NO

Table 2. Items and factor loadings for Factor 2, Ambition

1. Are you an ambitious, forceful personality?	YES	NO
2. Do you strongly need recognition and advancement at work?	YES	NO
3. Are you ambitious to get on socially?	YES	NO
4. Are you quite satisfied in your job, without too many ambitions?	YES	NO
5. Do you prefer not to compete with others?	YES	NO
6. Do you usually find you make much greater efforts than others to get something finished?	YES	NO
7. Do you enjoy competition and try hard to win?	YES	NO

Table 3. Items and factor loadings for Factor 3, Activity

1. Do you refuse to be rushed?	YES	NO
2. Do you get things done quickly?	YES	NO
3. Would you consider yourself a person of action?	YES	NO
4. Do you go 'all out', whatever you are doing?	YES	NO
5. Do you have less energy than most people?	YES	NO
6. Do you usually find you make much greater efforts than others to get something finished?	YES	NO
7. Are you usually slow in your movement?	YES	NO

Table 4. Items and factor loadings for Factor 4, Unrepressed

1. Are you an ambitious, forceful personality?	YES	NO
2. Do you refuse to be rushed?	YES	NO
3. Are you very conscious of time pressure and deadlines?	YES	NO
4. Would you consider yourself a person of action?	YES	NO
5. Do you express your feelings freely?	YES	NO
6. When under pressure or stress, do you do something about it immediately?	YES	NO

Table 5. Reliabilities (alpha) and mean scores for four factors, for males and females separately

	Reliabilities		Mean scores	
Factor	Male	Female	Male	Female
1	0.71	0.76	5.09 ± 2.95	5.66 ± 3.28
2	0.58	0.64	3.60 ± 1.81	2.72 ± 1.89
3	0.49	0.50	2.56 ± 1.50	2.33 ± 1.54
4	0.46	0.35	3.40 ± 1.53	3.13 ± 1.42

The reliabilities and the mean scores on the scales are shown, for males and females separately, in Table 5. The reliabilities are moderate for the first three factors, and inadequate for the fourth, which in any case is difficult to interpret. Women score higher on Factor 1, Tenseness, and men on Factor 2, Ambition and Competition; these findings are not unexpected. As will be shown later, Factor 1 correlates with N, Factor 2 with E, and women tend to have higher scores on N, men on E.

We next come to the intercorrelations between these four factors with each other, and with the scores of the EPQ on P, E, N and L. These are given in Table 6 for the males (top half) and the females (bottom half) separately. The correlations are in close agreement, and hence we need not discuss the sexes separately. Taking the four factors of our Type A inventory first, we can see that all the correlations are positive, except for correlations between Factor 1 and the rest; this suggests that there is indeed a general factor resembling the Hypothetical Type A behaviour type running through Factors 2, 3 and 4. However, the correlations are low enough to make it necessary to look at the factors separately when attempting to correlate them with actual disease; it is quite possible that even if the total score on the inventory is correlated with disease, this correlation may be caused by one or two of the factors only, without implicating the others.

Turning now to the correlations of the four factors with the EPQ scales, it is apparent that they correlate just as highly with these scales as they do with each other. E correlates quite highly (0.4–0.5) with Factors 2, 3 and 4, while N correlates even more highly with Factor 1. Thus the Tenseness aspect of Type A behaviour is correlated with N, the Ambition and Competition, the Activity and the Unrepressed aspects with E. P shows slight positive correlations with Factor 1, but this is not high enough to be of practical significance. The L scale correlates negatively with Factor 1, which is not unexpected as L usually correlates negatively with N (as it does in these samples too) and N is highly correlated with Factor 1. *It is clear that the factors emerging from our study of Type A behaviour can be largely accounted for in terms of the major dimensions of*

Table 6. Intercorrelations of four factors and P, E, N and L; males in top half, females in bottom half

					Correlations			
Variable	P	E	N	L	F1	F2	F3	F4
P		0.136	0.083	−0.300	0.183	0.146	−0.077	−0.018
E	0.132		−0.246	−0.117	0.037	0.420	0.340	0.473
N	0.127	−0.175		−0.169	0.477	0.055	−0.087	−0.053
L	−0.271	−0.144	−0.277		−0.231	−0.179	0.158	−0.004
F1	0.184	0.059	0.494	−0.279		0.335	0.170	0.207
F2	0.123	0.396	0.029	−0.112	0.273		0.359	0.430
F3	−0.089	0.355	−0.169	0.144	0.091	0.372		0.341
F4	−0.041	0.363	−0.048	−0.006	0.99	0.448	0.341	

Table 7. Heritabilities P values for fit of model and corrected heritabilities

Factor	h^2	Corrected h^2	P
1	0.39	0.53	0.23
2	0.39	0.64	$\simeq 0.4$
3	0.46	0.92	$\simeq 0.5$
4	0.32	0.78	$\simeq 0.5$

personality, Neuroticism and Extraversion, with total Type A score lying in the high N–high E quadrant. This agrees well with the other studies mentioned in our introduction.

GENETIC ANALYSIS

We can now turn to the *heritability* of the four components of the A Type isolated in this study. We have used the model-fitting technique of biometrical genetical analysis (Mather and Jinks, 1971), in which different models are tried out and tested against the data, starting with simple environmental models, then adding genetic components if the fit is poor. Previous work with personality factors P, E and N (Fulker, 1981) suggested that a combination of additive genetic factors (D_R) and within-family environmental variance components (E_1) would give a good fit, without any contribution of between-family environmental variance (E_2) components, and so it proved. Table 7 shows the calculated heritability (h^2), and also the P values concerning the fit of the model. The calculated h^2 values *underestimate* the actual heritability because they give the percentage which hereditary variance contributes to the total variance, which also includes measurement error; hence a correction is needed to express the proportion hereditary variance contributes to the total 'true' variance, i.e. with measurement error eliminated. The corrected values are also given in Table 7, and it will be seen that genetic factors play an important part in the genesis of Type A behaviour, in all its aspects. The correction is probably too severe, particularly because of the low reliability of some of the factors; all we would claim is that heritability of the factors making up Type A behaviour exceeds 50%, and is similar to the heritability of the personality factors P, E and N (Fulker, 1981).

Koskenvuo *et al.* (1979) have also given heritability values for the Bortner scale, but their calculation of heritability estimates uses a genetically meaningless formula. Recalculation of the heritability of the total score on the scale gives estimated values of 0.40 for the men 0.48 for the women; these (uncorrected) values are very similar to our own. Correction would elevate the heritability estimates to the region of 0.6 or thereabouts; no attempt has been made to carry out the calculations as the exact value of the scale reliability for the population tested is not known. As the correlations between the parts of the scale were found to be low, the reliability cannot be very high. Note the higher heritability for women, as compared with men; our analysis also suggested a difference in the same direction.

It is relevant that Floderus (1974) has demonstrated an association between Instability (measured on the EPI N scale) and a family history of CHD pertaining to the mother.

> "The number of subjects with both a father and a mother suffering infarction was twice as high in the instability group as compared to the complementary group." (p. 118)

Similar results are reported with respect to E.

> "The data suggest that a family history of CHD primarily is linked to subjects classified as extraverts." (p. 119)

Again the tendency was most marked with respect to the status of mother. However,

> "the association between extraversion and a family history of CHD, seemed to be valid only among smokers. Among non-smokers the results pointed to an inverse relationship. A family history of CHD among non-smokers thus seemed to be linked to an introverted behavior of the subject." (p. 119)

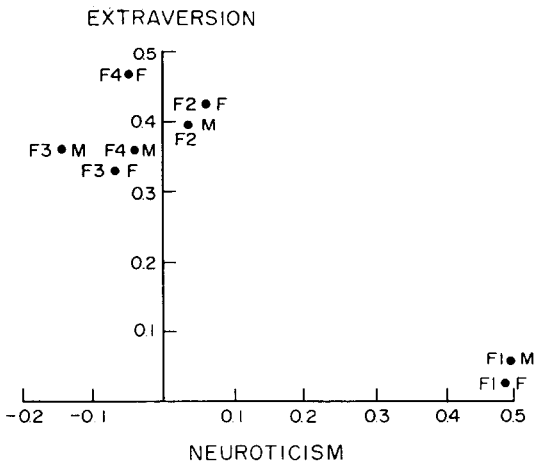

Fig. 1. Correlations between N and E scales with four Type A behaviour factors (F1, F2, F3, F4) for men (M) and women (F) separately.

Angina pectoris was also found linked with Instability, and, but only among non-smokers, with I. The interaction of the genetic links between personality, both N and E, and CHD, with smoking is interesting in view of the genetic links between personality and smoking (Eysenck, 1981b), but discussion here would be out of place. The results reported certainly suggest a genetic link between CHD and personality, modified by smoking habits.

DISCUSSION

Our data suggest that the various traits hypothesized to constitute Type A personality do indeed correlate together to some extent, although the distribution of total scores is near normal and does not justify in any way the typological notion of distinct and separate groups, Type A and Type B. However, the traits making up Type A personality are not independent of the major dimensions of personality recognized in general psychology, and in particular N and E are both appreciably correlated with the factors which make up Type A personality. Some aspects of Type A behaviour are clearly determined strongly by the subject's N-stability, others by his or her E–I. Factor analysis of the correlations in Table 6 shows that for both sexes there are only two clearly marked factors, orthogonal to each other, and with E and N having the highest loadings, identifying these factors as Extraversion and Neuroticism; on these factors Tenseness has high loadings only on N, and none on E; Ambition, Activity and Unrepressed emotion all have high loadings on E, and none on N (Fig. 1). Thus clearly Type A behaviour is not unitary; certain aspects of it are closely related to N, others to E, and the two groups of Type A behaviour traits are themselves almost unrelated. The best description of the behaviour of our subjects, as far as Type-A-related traits are concerned, is in terms of E and N; added to this must be specific groups of traits identified in terms of our four factors derived from the factor analysis of Type A behaviour. In this general description, it will be noted, there is no trace remaining of the concept of Type A behaviour as such; the concept has been shown to be a chimera, stemming from perfectly correct observations of the originators of the concept, followed by psychometrically inappropriate analysis, and disregard of much better established personality dimensions.

One question remains. In so far as E and N do not account for all the variance contained in the four factors into which we have analysed Type A behaviour, is it that the relationship with CHD is due to E and N, to any or all of the four Type A factors; or to both? The only study to throw much light on this problem is one by Bass and Wade (1982).

Bass and Wade (1982) studied three groups of patients, the first of which ($n = 30$) complained of angina but were cleared of actual cardiac damage. The second group ($n = 16$) showed signs of slight cardiac disease and a third group ($n = 53$) was seriously affected by cardiovascular impairments and required surgery. He gave all subjects a thorough psychiatric morbidity interview, the EPQ and the Bortner 'A' Type Questionnaire. The results showed the first group (no heart

disease) to have the highest psychiatric morbidity, high scores on N and E, and the highest scores on the 'A' Type behaviour questionnaire. The intermediate group with some cardiac impairment had the next highest psychiatric morbidity, the highest E score of all groups, and medium 'A' Type scores. The groups with serious cardiac disease scored *lowest* on psychiatric morbidity, on E and N, and on the 'A' Type behaviour.

Since high E and N scorers have been linked with the 'complainer' syndrome, it seems likely that these same characteristics apply to 'A' types but that these are not necessarily the patients who subsequently have heart attacks. The 'A' type appears more to describe those patients complaining of chest pains, who have no physical heart defects, and whose symptoms could be due to psychosomatic disorders especially hyperventilation, than those patients who are prone to actual coronaries. On the other hand, in the seriously ill heart patient group, the 'A' score was correlated with N, whereas in the group with no demonstrable heart disease, the 'A' score was more correlated with E.

Others have also noted that in groups referred to cardiac units, severity of disorder is *negatively* correlated with Type A behaviour, however assessed (Dimsdale, Hackett, Hutter, Block and Catazano, 1978; Ahnve, Faire, Orth-Gomer and Theorell, 1979). These results are so directly counter to the original hypotheses, which led to the development of the typology, that they must throw considerable doubt on their adequacy.

What is now needed is a prospective study in which the EPQ and 'A' Type questionnaire are given to normal subjects coming for check-ups at a health clinic; it then remains to be seen whether better predictions of future CHD is obtained by the EPQ, or by the Type A questionnaire; to what extent both make similar predictions; and to what extent a combination of both might improve prediction.

Acknowledgement—We are indebted to the Council for Tobacco Research, U.S.A., for a grant which made this study possible.

REFERENCES

Ahnve S., Faire U., Orth-Gomer K. and Theorell T. (1979) Type-A behaviour in patients with non-coronary chest pain admitted to a coronary care unit. *J. psychosom. Res.* **23,** 219–223.

Baer P. E., Collins F. H., Bourianoff G. G. and Ketchel M. F. (1979) Assessing personality factors in essential hypertension with a brief self-report instrument. *Psychosom. Med.* **41,** 321–330.

Bass C. and Wade C. (1982) Psychological enquiries in patients with normal and abnormal coronary arteries. *Lancet* **Nov.,** 1147–1149.

Bendien J. and Groen J. (1963) A psychological-statistical study of neuroticism and extraversion in patients with myocardial infarction. *J. psychosom. Res.* **7,** 11–14.

Bortner R. W. (1969) A short rating scale as a potential measure of pattern A behavior. *J. chron. Dis.* **22,** 87–91.

Dimsdale J. E., Hackett T. P., Hutter M., Block D. C. and Catazano D. (1978) Type A personality and extent of coronary atherosclerosis. *Am. J. Cardiol.* **42,** 583–586.

Eysenck H. J. (1970) *The Structure of Personality.* Methuen, London.

Eysenck H. J. (Ed.) (1981a) *A Model for Personality.* Springer, New York.

Eysenck H. J. (1981b) *The Causes and Effects of Smoking.* Sage, Los Angeles, Calif.

Eysenck H. J. and Eysenck S. B. G. (1975) *Manual of the Eysenck Personality Questionnaire.* Hodder & Stoughton, London.

Floderus B. (1974) Psycho-social factors in relation to coronary heart disease and associated risk factors. *Nord. hyg. Tidskr. (Suppl.)* **6.**

Frankenhaeuser M., Lundberg U. and Forsman L. (1980) Note on arousing Type A persons by depriving them at work. *J. psychosom. Res.* **24,** 45–47.

Friedman M. and Roseman R. H. (1974) *Type A Behavior and Your Heart.* Wildwood House, London.

Fulker D. (1981) The genetic and environmental architecture of psychoticism, extraversion and neuroticism. In *A Model for Personality* (Edited by Eysenck H. J.) Springer, New York.

Innes J. M. (1980) Impulsivity and the coronary-prone behavior patterns. *Psychol. Rep* **47,** 976–978.

Jenkins C. D., Zyzanski S. J. and Roseman R. H. (1971) Progress towards validation of a computer-scored test of type A coronary-prone behavior patterns. *Psychosom. Med.* **33,** 192–202.

Jenkins C. D., Zyzanski S. J., Ryan T. J., Flessas A. and Tannenbaum S. I. (1977) Social insecurity and coronary-prone type A responses as identifiers of severe atherosclerosis. *J. consult. clin. Psychol.* **45,** 1060–1067.

Koskenvuo M., Langinvainio H., Kaprio J., Rautasalo I. and Sarna S. (1979) *The Finnish Twin Registry: Baseline Characteristics, Section 700: Occupational and Psychosocial Factors.* Hensinkin Yliopston Kausanterreystieteen Laitos, Helsinki, Finland.

Lovallo W. R. and Pishkin V. (1980) Type A behavior, self-involvement, autonomic activity, and the traits of neuroticism and extraversion. *Psychosom. Med.* **42,** 329–334.

Mather K. and Jinks J. L. (1971) *Biometrical Genetics.* Chapman & Hall, London.

Matthews K. A. and Krantz D. S. (1976) Resemblances of twins and their parents in pattern A behavior. *Psychosom. Med.* **38,** 140–144.

Nowack K. M. and Sassenrath J. M. (1980) Coronary-prone behavior, locus of control, and anxiety. *Psychol. Rep.* **47,** 359–364.

Rim Y. (1981) Pattern-A behaviour and its personality correlates in students of both sexes. *Scientia paedagogica exp.* **18,** 98–102.

Review Panel on Coronary-prone Behaviour and Coronary Heart Disease (1981) Coronary-prone behavior and coronary heart disease: a critical review. *Circulation* **63,** 1199–1215.

Rosenman R. H. and Chesney M. A. (1980) The relationship of Type A behavior patterns to coronary heart disease. *Activitas nerv. sup.* **22,** 1–45.

Slaby A., Horwath M. and Frantik E. (1981) Cardiovascular response in stress testing related to some personality characteristics. *Activitas nerv. sup.* **23,** 64–66.

Steptoe A. (1981) *Psychological Factors in Cardiovascular Disorders.* Academic Press, London.