

SMOKING, PERSONALITY AND PSYCHOSOMATIC DISORDERS*

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1. INTRODUCTION

THIS study is a sequel to an earlier one, in which the relationship between smoking and personality was studied [5]. The main interest in any relationship of this kind lies in the light which it may throw on the hypothesis that the relationship between lung cancer and smoking may not be a direct causal one, but may rather be mediated by certain genotypic differences. In the original study it was found that there was a highly significant relationship between smoking and extraversion, in the sense that non-smokers were the least extraverted, light smokers were slightly more extraverted, medium smokers more extraverted still, and heavy smokers most extraverted of all‡. Pipe smokers were the most introverted group, and ex-smokers fell halfway between light and medium smokers. There was no relationship between smoking and neuroticism (or emotionality), but an almost significant relationship was found between smoking and the personality trait of rigidity.

Since this first report, the hypothesis of the relationship between personality and predisposition to the development of cancers has been strengthened by the findings of Hagnell [12] that cancer is found more frequently in extraverted than introverted persons, by the demonstration by Kissen and Eysenck [13] of the relationship between personality and cancer in male lung cancer patients, and by the discovery of a highly significant relationship between extraversion and cancer by Coppen and Metcalfe [2]. It seemed desirable to repeat the original questionnaire study, with certain modifications, for the following reasons:

1. In their very thorough review of "psychological and related characteristics of smokers and non-smokers," Matarazzo and Saslow [15] show that most investigators have demonstrated a relationship between smoking and neuroticism, which is contrary to our own findings. It is, of course

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† This paper reports the findings of a survey carried out by Mass Observation Ltd. in the autumn of 1961 on behalf of the Tobacco Manufacturers' Standing Committee. The survey was carried out under the general supervision of the present writer, and it is a pleasure here to acknowledge the excellence of the technical work in sampling and interviewing, which was the responsibility of M. Tarrant and L. England. D. M. Kissen, B.Sc., M.D. advised on the formulation of the questions relating to psychosomatic illnesses, and his unstinting help in this, and in answering questions and giving advice, contributed greatly to the interest of the findings.

‡ Extraversion-introversion is regarded as a personality continuum or dimension which is differentiated from simpler concepts, such as traits, in the following way. A trait such as sociability, or impulsiveness, refers to habitual behaviour of a certain kind; consequently all the questions relating to it will tend to be rather similar. Higher order concepts, like extraversion-introversion, or neuroticism, contain several traits which are fairly closely linked with each other. Thus it is found that people who are *sociable* also tend to be *impulsive*; they also tend to show various other traits. The notion of extraversion arises from the observed relationship between sociability, impulsiveness, and other traits [5].

true that most of these reports come from American investigators, and it does not follow necessarily that relationships on one side of the Atlantic will be identical with those found on the other. Nevertheless it seemed imperative to check our findings, and disprove, if we could, the null hypothesis supported by our original study.

2. The relationship between extraversion and smoking, although it had been anticipated on theoretical grounds, remains an isolated finding, and is hardly duplicated in any of the studies summarized by Matarazzo and Saslow. It seemed necessary, therefore, to repeat this part of the study in order to make quite certain that the statistical validity of the findings did actually stand up on repetition.
3. It also seemed desirable to extend the range of questions used for the measurement of extraversion for the following reasons.
 - (a) The proof of a relationship between smoking and extraversion is obviously stronger the more reliable the measurement of extraversion can be made. Reliability is in part a function of the number of questions used to measure the personality traits in question, and on these grounds alone a much more extensive questionnaire seemed to be called for.
 - (b) If the findings turned out positive, it was anticipated that a further experimental study would be carried out dealing with the measurement of personality in persons actually suffering from cancer. The anticipated differences between cancer sufferers and others might be quite small, and it was obviously essential to have as sensitive a measuring instrument as possible for the purpose. Such a measuring instrument required detailed knowledge of personality differences between smokers and non-smokers, and this again necessitated the use of a larger number of questions.
 - (c) Recent work carried out since the original report was completed has shown that there are two partly independent traits involved in the measurement of extraversion, namely impulsiveness and sociability [6]. It seemed possible that the relationship between extraversion and smoking might be due entirely to one or the other of these two traits, and it seemed necessary to discover whether one or both were in fact responsible.
4. The previous report paid attention to class differences but did not include any references to rural or urban living conditions of the subjects. In view of the known or suspected effects that this might produce it seemed desirable to select samples with special reference to this factor.
5. In the study by Kissen and Eysenck [13] on the personality of lung cancer patients, it had been found that the presence or absence of psychosomatic disorders played a significant part, and it seemed desirable to include a series of questions on psychosomatic disorders in order to see whether these would be related to smoking, to personality, or to any possible interactions that might be observed.
6. The question of inhaling has always been of special interest in the study of lung cancer and smoking, but nothing is known about the relationship between inhaling and personality. It seemed desirable therefore to include such a question in a new survey to discover facts relating to personality patterns of people who inhale and people who do not. It was with all these considerations in mind that the present scheme was drawn up, and the total questionnaire administered will be found in Appendix A.

It had originally been anticipated that the factor of rigidity would also have to be investigated by means of a longer series of questions because this personality trait was found to be related to smoking, albeit insignificantly, in our original study. However, a special questionnaire investigation was conducted to clear up the relationship between rigidity and other aspects of personality, and it was found that rigid people are introverted, high on neuroticism and low in intelligence [6]. When these major factors were eliminated there was no clear variance left for the rigidity items. It would appear therefore that whatever contribution rigidity might have been made to smoking habits in our original study was by virtue of its correlation with these other variables, and it did not seem necessary therefore to include items relating to rigidity in the present study.

2. THE POPULATION STUDIED

As in the previous study, we concentrated our attention on six main groups: light, medium and heavy cigarette smokers, pipe smokers, non-smokers and ex-smokers. These groups were defined, as before, in terms of the following criteria:

Light smokers were taken to be those who said that they smoked 14 or fewer cigarettes daily.

Medium smokers were taken to be those who said that they smoked between 15 and 24 cigarettes daily.

Heavy smokers were taken to be those who said that they smoked 25 or more cigarettes daily.

Pipe smokers were taken to be those who smoked a pipe only, or, if they had more than one smoking outlet, accounted for more than three-quarters of their total consumption in pipe tobacco.

Ex-smokers were taken to be those who did not smoke at present but who claimed that, in the past, they had smoked at a rate equivalent to more than one cigarette a day or 2 oz (57 g) of tobacco in two months for at least as long as a year.

Non-smokers were those who did not smoke at present and claimed that in the past they had not smoked more than one cigarette a day or more than 2 oz (57 g) of tobacco for at least a year.

Each of these six groups was broken down into rural and urban, and each of these in turn into middle and working class. There are thus $6 \times 2 \times 2 = 24$ sub-groups in all; each of these contains roughly 100 male subjects aged between 45 and 64; the exception is the ex-smoker group which contained 1000 rather than 400 subjects. Our reason for concentrating on male subjects of this particular age group was simply that we regarded this study as preliminary to a subsequent one of the personality of lung cancer patients, and as is well known, these tend to be primarily within this age and sex group. Our special interest in the ex-smoker group derived from the fact that little was known about these people, and that it seemed worthwhile to learn more about them than could be done by having them represent only a small part of the total group.

Two class groups were used, but the definitions used have changed since the previous study, to bring them into line with current practice. The original "C" group has been split into two—"C1" and "C2"—the former consisting of the lower paid clerical workers, and the latter the skilled manual workers. Thus the two groups of the previous study, i.e. ABC and DE, have been replaced by ABC1 and C2DE respectively.

The third variable on which the analytic sample was based was that of urban/rural. Here it was felt that the usual distinction by Local Authority Areas should not be followed, as "country" towns could well mask any effects, and reduce the usefulness of the study. Therefore, the urban half of the sample was confined to the seven conurbations as defined by the Registrar General [9, 16]. The rural half of the sample was carried out in Local Authority Areas but excluding 24 "high density" rural areas [10, 11]. The achieved sample is given in Table 1.

TABLE 1

Type of smoker	Conurbation		Rural	
	ABC1	C2DE	ABC1	C2DE
Light	103	107	103	130
Medium	103	115	105	132
Heavy	99	103	97	101
Pipe	105	101	103	105
Non-smoker	96	96	93	93
Ex-Smoker	313	347	216	228

A three-stage sampling design was used in the conurbations and a four-stage design in the rural areas. In both cases only the last stage (selection of the individual) was on a quota basis. All the previous stages were by random selection with probabilities proportional to size of either population or electorate. Details are given in Mass-Observation Report: Personality Factors and Smoking, Part II; these would not be appropriate here.

3. THE PERSONALITY QUESTIONNAIRE

As mentioned above, the questionnaire used in this inquiry is given in Appendix A; also given there is a factor analysis of the intercorrelations between the items. On the basis of this analysis, as well as of several similar analyses carried out in the past on questionnaires incorporating the same or similar questions, we derived a key for the actual scoring of the questionnaire. This key denotes those questions which contribute to the factor of *neuroticism* (*N*); those that contribute to the factor of *extraversion* (*E*); those that contribute to the score for *sociability* (*S*); and those that contribute to the score for *impulsiveness* (*IMP*). If the letter in the key is bracketed then the "yes" answer is scored positively for neuroticism, extraversion, sociability or impulsiveness; if it is not bracketed, then the "no" answer is scored positively. Also given behind some questions is a plus or a minus sign. This relates to the fact that that question was found by itself to give a significant correlation between the personality trait it measures and smoking; further details about this will be given in relation to our discussion of the individual questions themselves.

The scores for the factors were derived in the following manner.

- (a) Neuroticism. There are twenty-four capital *N* items, and the score is derived by giving each answer in agreement with the key the score of one; any other answer is scored zero.
- (b) Impulsiveness and sociability are scored in the same manner, i.e. by giving one point to each answer agreeing with the key. Sociability and impulsiveness are combined into one score called S-I by subtracting each person's impulsiveness score from his sociability score; it will be obvious that some scores will be negative.
- (c) The extraversion score is made up of three parts. First we take the impulsiveness score, then we add to this the sociability score, and finally we add the 14 extraversion items, scoring one point for each agreement with the key. A small number of items is left unscored.

4. RESULTS: PERSONALITY

Tables 2, 3 and 4 give the means and variances of the neuroticism, extraversion and S-I scores, divided into the twenty-four groups. These figures constitute the main burden of our results; they were submitted to a three way analysis of variance. Table 5 shows the result of such an analysis for the neuroticism factor. It will be seen that both class and locality (i.e. rural/urban) make a very significant contribution, but, as in our first study, that of "groups" (i.e. smoking groups) is quite insignificant. There is a slight and barely significant inter-action between class and locality. These figures then support our previous conclusion and demonstrate that neuroticism and smoking habits do not seem to be related in any way.

Table 6 gives a similar analysis for the extraversion data. It will be seen that class is quite unrelated to extraversion, that locality shows some relationship, significant at the 5 per cent level, but that smoking shows a very significant relationship as the 1 per cent level. This is analysed in detail in Table 6a, which gives *t* tests for all possible comparisons between groups.

TABLE 2.—NEUROTICISM

Type of Smoker	District	Class	Average	Variance	Number of Men
Light	Conur.	ABC1	8.33	28.47	103
		C2DE	8.70	37.20	107
	Rural	ABC1	8.17	22.63	101
		C2DE	7.39	26.32	130
Medium	Conur.	ABC1	8.18	24.89	103
		C2DE	8.97	30.57	115
	Rural	ABC1	6.42	22.55	105
		C2DE	7.38	25.56	132
Heavy	Conur.	ABC1	6.96	25.47	99
		C2DE	9.65	31.52	103
	Rural	ABC1	8.66	30.13	97
		C2DE	8.38	31.60	101
Pipe	Conur.	ABC1	7.45	28.79	105
		C2DE	8.76	24.52	100
	Rural	ABC1	7.55	25.17	103
		C2DE	7.90	30.24	105
Non-Smoker	Conur.	ABC1	7.39	19.05	96
		C2DE	9.35	19.80	96
	Rural	ABC1	6.94	28.09	93
		C2DE	8.11	33.65	93
Ex-Smoker	Conur.	ABC1	7.70	25.26	313
		C2DE	8.58	29.45	347
	Rural	ABC1	7.06	23.65	216
		C2DE	7.24	24.60	228

TABLE 3.—EXTRAVERSION

Type of Smoker	District	Class	Average	Variance	Number of Men
Light	Conur.	ABC1	17.67	29.36	103
		C2DE	18.41	31.69	105
	Rural	ABC1	17.07	36.45	103
		C2DE	17.32	29.37	130
Medium	Conur.	ABC1	18.41	34.45	103
		C2DE	18.74	25.11	115
	Rural	ABC1	18.65	24.05	105
		C2DE	18.95	25.15	132
Heavy	Conur.	ABC1	19.39	31.26	99
		C2DE	18.95	34.61	103
	Rural	ABC1	18.68	38.01	97
		C2DE	18.78	30.47	101
Pipe	Conur.	ABC1	17.13	31.94	105
		C2DE	18.27	30.77	101
	Rural	ABC1	17.44	22.86	103
		C2DE	15.50	27.85	105
Non-Smoker	Conur.	ABC1	18.40	27.67	96
		C2DE	18.80	33.03	96
	Rural	ABC1	17.16	35.36	93
		C2DE	16.12	30.01	93
Ex-Smoker	Conur.	ABC1	17.59	31.94	313
		C2DE	17.91	34.52	347
	Rural	ABC1	17.56	26.96	216
		C2DE	17.73	27.14	228

TABLE 4.—S-I/TYPE

Type of Smoker	District	Class	Average	Variance	Number of Men
Light	Conur.	ABC1	2.06	10.16	103
		C2DE	1.35	8.91	108
	Rural	ABC1	1.86	9.96	101
		C2DE	1.70	9.08	130
Medium	Conur.	ABC1	1.97	8.95	103
		C2DE	1.73	7.54	115
	Rural	ABC1	2.68	9.50	105
		C2DE	1.90	8.91	132
Heavy	Conur.	ABC1	2.71	6.52	99
		C2DE	1.12	9.52	103
	Rural	ABC1	2.64	7.71	97
		C2DE	1.43	7.45	101
Pipe	Conur.	ABC1	2.10	8.80	105
		C2DE	1.72	7.57	101
	Rural	ABC1	2.31	6.50	103
		C2DE	0.86	7.51	105
Non-Smoker	Conur.	ABC1	2.36	10.13	96
		C2DE	1.33	7.56	96
	Rural	ABC1	2.05	8.99	93
		C2DE	1.03	7.78	93
Ex-Smoker	Conur.	ABC1	2.20	8.63	213
		C2DE	1.40	9.01	346
	Rural	ABC1	2.09	8.10	216
		C2DE	1.65	7.80	228

TABLE 5.—NEUROTICISM—ANALYSIS OF VARIANCE

Source	<i>d.f.</i>	Sums of Squares	Mean Square	Variance Ratio	
Class	1	430.15	430.15	15.9848 **	
Locality	1	487.32	487.32	18.1093 **	
Groups	5	160.40	32.08	1.1921 N.S.	
Class × Locality	1	195.44	195.44	7.2627 *	
Class × Groups	5	210.78	42.16	1.5667 N.S.	
Groups × Locality	5	243.77	48.75	1.8116 N.S.	
Residual	3167	85230.86	26.91		
Means	Locality		Means		
Class ABC1	Urban	Rural	7.55	(1) Light	8.11
	7.68	7.39		(2) Medium	7.74
Class C2DE	8.88	7.62	8.28	(3) Heavy	8.42
	8.30	7.52		(4) Pipe	7.91
				(5) Non-Smoker	7.95
				(6) Ex-Smoker	7.76

It will also be seen that there is a barely significant interaction effect between locality and groups. The meaning of this can best be seen in Fig. 1 in which we have plotted extraversion scores for the six smoking groups, separated out for urban and

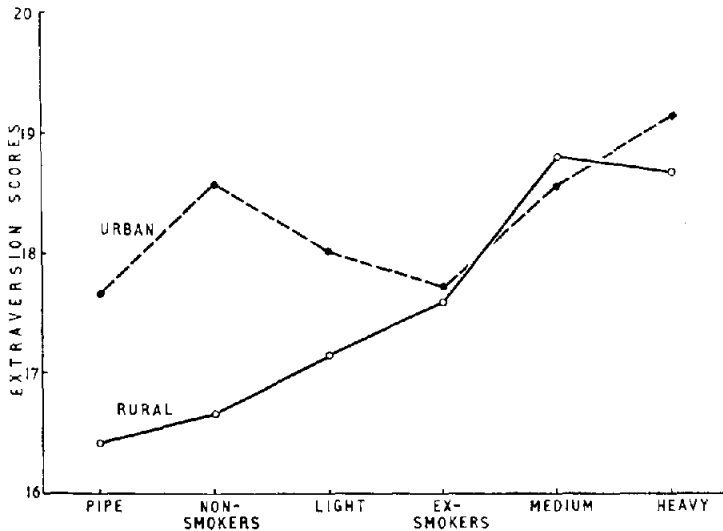


FIG. 1. Extraversion scores of different groups of smokers, divided according to urban or rural residence.

rural residents. It will be seen that locality shows a marked difference for the non-smoking group, with urban residents being more extraverted than rural residents; a similar though somewhat less extreme effect is noticeable for pipe smokers and light smokers. No differences, however, appear between urban and rural residents who are either ex-smokers, medium or heavy smokers. The reasons for this interaction are obscure and probably not very important from our point of view. What is important is that again we find pipe smokers and non-smokers to be introverted, while light, medium and heavy smokers score in the extraverted direction, with a monotonic increase in extraversion as smoking increases. Ex-smokers are again between light and medium smokers, and are almost indistinguishable from light smokers. It is very gratifying to find that the results of this study bear out so completely the result of the previous one.

Table 7 reports an analysis of variance of the S-I score; here significance only attaches to social class but none to locality or to groups. We appear to be safe, therefore, in saying that the personality trait which is related to smoking is extraversion as a whole, rather than any of its sub-divisions.

We must now turn to a detailed study of the individual questions. The reason for not resting content with the scores derived above is as follows. Each question may be thought to contain three main components. One of these is error; if the same question is asked again on a different occasion, then the answer will not invariably be the same. This unreliability of a question, which previous research has shown not to be very important for the ones here employed, is not an analysable element in the

TABLE 6.—EXTRAVERSION—ANALYSIS OF VARIANCE

Source	<i>d.f.</i>	Sums of Squares	Mean Square	Variance Ratio
Class	1	7.70	7.70	—
Locality	1	231.23	231.23	7.5888 *
Groups	5	1123.98	224.80	7.3777 * *
Class × Locality	1	73.13	73.13	2.4001 N.S.
Class × Groups	5	74.33	14.87	—
Locality × Groups	5	392.16	78.43	2.5740 *
Residual	3168	96535.13	30.47	

Means	Locality		Means		
	Urban	Rural			
Class ABC1	17.957	17.731	17.852	(1) Light	17.60
Class C2DE	18.345	17.515	17.949	(2) Medium	18.70
				(3) Heavy	18.95
				(4) Pipe	17.07
				(5) Non-Smoker	17.63
	18.157	17.618		(6) Ex-Smoker	17.71

TABLE 6a.—INDIVIDUAL *t* TESTS
BETWEEN GROUPS

	<i>t</i> —	Significance level <i>p</i> <
1 × 2	2.9806	0.01
1 × 3	3.5411	0.01
1 × 4	1.4020	N.S.
1 × 5	0.0775	N.S.
1 × 6	0.3534	N.S.
2 × 3	0.6606	N.S.
2 × 4	4.3444	0.01
2 × 5	2.7834	0.01
2 × 6	3.2160	0.01
3 × 4	4.8556	0.01
3 × 5	3.3322	0.01
3 × 6	3.8469	0.01
4 × 5	1.4248	N.S.
4 × 6	2.0092	0.05
5 × 6	0.2429	N.S.

answer and can only be minimized. The second component of each question is that part which is related to such higher-order concepts as neuroticism or extraversion; it is by summing this part over several questions, thus cancelling out all specific and error components, that we obtain a reasonable measure of these higher-order concepts. A third component, however, is specific to each question; this is not taken into account in our factor but is lost in the process of averaging. It is possible that some of these specific contributions of individual questions may be of interest and importance, and it is for this reason that we have carried out special three-way analyses of variance on each of the sixty-four questions separately. The detailed figures are given in the Mass Observation report [14]. More items were individually significant in relation to locality and class than in relation to smoking groups. As regards locality 23 items were significant at the 5 per cent level and 5 at the 1 per cent level. In relation to class 25 items were significant at the 5 per cent level and 14 at the 1 per cent

TABLE 7.—S-I: ANALYSIS OF VARIANCE

Source	<i>d.f.</i>	Sums of Squares	Mean Square	Variance Ratio
Class	1	472.50	472.50	55.7193 * *
Locality	1	0.99	0.99	—
Groups	5	43.55	8.71	1.0271 N.S.
Class × Locality	1	0.73	0.73	N.S.
Class × Groups	5	78.13	15.63	
Locality × Groups	5	41.81	8.36	
Residual	3168	26832.58	8.47	

Means	Locality		Means		
	Urban	Rural			
Class ABC1	2.221	2.245	2.232	(1) Light	1.7349
Class C2DE	1.434	1.494	1.462	(2) Medium	2.0529
	—	—	—	(3) Heavy	1.9604
	1.816	1.851		(4) Pipe	1.7450
				(5) Non-Smoker	1.6949
				(6) Ex-Smoker	1.8138

level. As regards smoking 16 items were significant at the 5 per cent level and none at the 1 per cent level. These latter items have been identified by a plus or a minus sign in the Appendix. The nature of the sign can be explained in the following way. Take item 3: "Are you inclined to be quick and sure in your actions?" This question refers to extraversion, as indicated by the fact that there is a capital E in the key; it is also bracketed which means that the "yes" answer is the extraverted answer. The plus sign in the last column means that heavy and medium smokers taken together give significantly more "yes" answers than the non-smokers and pipe smokers taken together. It will be seen that with only four exceptions all the significant items relate to extraversion (and/or impulsiveness and sociability) and in each case the relationship is in the predicted direction, i.e. the extraverted answer is given more frequently by the heavy smoking groups. On the whole therefore our findings suggest that the specific element in the question is not related particularly strongly to smoking, but may be more strongly related to locality and particularly to social class. This is a welcome result as the interpretation of specific content in relation to some other variable is usually quite a tricky one to discover.

We may conclude this part of the paper therefore by stating the following conclusions:

1. Degree and type of smoking are not related to neuroticism.
2. Degree and type of smoking are strongly related to extraversion, in the sense that pipe smokers are introverted, as are non-smokers; light, medium and heavy smokers are extraverted, increasingly so in that order. Ex-smokers are indistinguishable from light smokers.
3. Sociability and impulsiveness are not specifically related to smoking habits once their extraverted component has been taken into account.
4. It is doubtful whether the specific content of any of the questions used is relevant to smoking habits, over and above the contribution each question makes to the measurement of the factor of extraversion.

5. RESULTS: INHALING

The reasons for our interest in possible personality correlates of inhaling have been pointed out above. The results of relating scores on our three personality variables to inhaling in the light smoker, medium smoker and ex-smoker groups are given in Table 8.

TABLE 8

	Light Smoker		Medium Smoker		Heavy Smoker		Ex-Smoker	
	Inhaler	Non-Inhaler	Inhaler	Non-Inhaler	Inhaler	Non-Inhaler	Used to Inhale	Did not Inhale
<i>Neuroticism</i>								
Average	8.56	7.24	7.84	7.11	8.36	8.31	8.03	7.19
Variance	30.95	23.32	27.72	22.79	30.16	26.65	27.46	24.76
Standard Deviation	5.56	4.83	5.27	4.77	5.49	5.16	5.24	4.98
<i>Extraversion</i>								
Average	18.01	16.84	18.76	18.57	18.89	19.30	17.57	17.97
Variance	31.22	30.22	28.87	23.42	35.27	30.28	32.72	28.72
Standard Deviation	5.59	5.50	5.37	4.84	5.94	5.50	5.72	5.36
<i>S-I</i>								
Average	1.88	1.24	2.06	2.10	1.92	1.93	1.77	1.88
Variance	5.57	8.77	8.67	9.08	5.77	7.72	5.60	8.79
Standard Deviation	2.36	2.96	2.94	3.01	2.40	2.78	2.37	2.97
Base	288	152	367	102	321	83	729	370

Relationships between inhaling and extraversion and the S-I factor are clearly quite insignificant, but it will be noted that in every case the inhalers have a higher degree of neuroticism than do those who do not inhale. Statistical tests of the significance of these differences indicate that for both light smokers and ex-smokers differences were significant at better than the 1 per cent level; for medium smokers the differences were not significant. These results certainly suggest that inhaling may be more prevalent among the more neurotic and emotionally disturbed smokers.

6. RESULTS: PSYCHOSOMATIC DISORDERS AND SMOKING

A large part of the interview was given over to the elicitation of former psychosomatic complaints of the respondent, as it was thought, in view of the Kissen and Eysenck [6] results, that this variable might play an important part in our work. The questionnaire used was carefully designed with the invaluable help of Dr. D. M. Kissen, and in spite of our original misgivings no insuperable difficulties arose in the actual administration. The actual form of questions used, as well as the categorization of answers, is given below in Appendix B. A total score for psychosomatic disorder was established by simply giving each affirmative answer a point and adding up the points. This is, of course, a very mechanical and uninspired method, but there did not seem to be any principles which might guide us in improving upon this weighting scheme. Table 9 gives the means and variances of this total score for all the sub-groups, as well as the number of cases in each group.

TABLE 9.—PSYCHOSOMATIC DISEASES: NUMBER OF COMPLAINTS

Type of Smoker	District	Class	Average	Variance	Number of Men
Light	Conur.	ABC1	3.27	5.16	103
		C2DE	3.90	6.31	107
	Rural	ABC1	3.37	5.65	101
		C2DE	3.18	4.06	129
Medium	Conur.	ABC1	3.68	6.66	103
		C2DE	4.28	7.38	115
	Rural	ABC1	3.31	4.87	104
		C2DE	3.79	8.31	132
Heavy	Conur.	ABC1	3.40	5.35	98
		C2DE	3.71	5.65	100
	Rural	ABC1	4.01	7.74	97
		C2DE	3.61	6.84	100
Pipe	Conur.	ABC1	2.86	4.45	105
		C2DE	3.55	5.81	101
	Rural	ABC1	3.73	6.21	103
		C2DE	3.75	8.73	104
Non-Smoker	Conur.	ABC1	3.42	4.20	96
		C2DE	3.36	5.89	96
	Rural	ABC1	2.73	4.70	93
		C2DE	3.26	5.49	93
Ex-Smoker	Conur.	ABC1	3.81	7.17	313
		C2DE	4.06	7.50	345
	Rural	ABC1	3.67	6.02	214
		C2DE	3.90	7.66	227

An analysis of variance was carried out, establishing at a 1 per cent level the significance of smoking type and social class. Place of residence was not significantly related to psychosomatic disease. Table 10 shows details of the computation.

TABLE 10

Source	<i>d.f.</i>	Sums of Squares	Mean Square	Variance Ratio
Between types	5	180.60	36.12	5.6438 * *
Between places	1	14.13	14.13	2.2078 N.S.
Between classes	1	53.37	53.37	8.3391 * *
Residual	3155	20192.12	6.40	

It will be clear from the data given in Table 10 that working class groups, regardless of residence, have more psychosomatic disorders than do middle class groups. As regards the smoking groups it seemed advisable to carry out individual *t* tests between groups to indicate more clearly the nature of the differences: these tests are reported in Table 11.

TABLE 11.—INDIVIDUAL *t* TESTS

Light × Medium	= 2.1270 *
Light × Heavy	= 1.4826 N.S.
Light × Pipe	= 0.2885 N.S.
Light × Non-Smoker	= 1.2399 N.S.
Light × Ex-Smoker	= 3.2229 **
Medium × Heavy	= 0.5744 N.S.
Medium × Pipe	= 1.8020 N.S.
Medium × Non-Smoker	= 3.2924 **
Medium × Ex-Smoker	= 0.7085 N.S.
Heavy × Pipe	= 1.1795 N.S.
Heavy × Non-Smoker	= 2.6368 **
Heavy × Ex-Smoker	= 1.3475 N.S.
Pipe × Non-Smoker	= 1.4993 N.S.
Pipe × Ex-Smoker	= 2.8081 **
Non × Ex-Smoker	= 4.5081 **

The data suggest that heavy, medium and ex-smokers have the largest number of psychosomatic disorders, with non-smokers having the least number. Light and pipe smokers are intermediate. Not all the differences are, of course, significant, but the trend is rather clear.

It is interesting to see whether this relationship between smoking and number of psychosomatic disorders might be due to extraversion; *a priori* one would not consider this a very likely hypothesis as in the past psychosomatic disorders have usually been found positively correlated with introversion rather than with extraversion. The actual correlation between extraversion and psychosomatic disorders is -0.1021 , showing that the relation between psychosomatic disorders and smoking is not due to the personality trait of extraversion. The correlation between psychosomatic disorders and neuroticism is, as expected, positive and highly significant: $r = 0.2944$. In other words, the more emotionally labile person is more liable to psychosomatic disorders. There is also a slight negative correlation between psychosomatic disorders and the third factor score, S/I: $r = -0.1289$, suggesting that impulsive rather than sociable people develop psychosomatic disorders. However, the correlation is so low that no importance can be attached to it.

7. RESULTS: PSYCHOSOMATIC DISORDERS AND PERSONALITY

In the previous section we have lumped together all the psychosomatic disorders in a total score; it seemed desirable to perform a more detailed analysis of the data in order to throw some light on the question of whether in doing so we may not have obscured certain relationships. Accordingly, data are presented in Table 12 on selected disorders; given in this Table are sample size, and means and variance of the neuroticism and extraversion scores of the different groups. It was expected, from the work of Sainsbury [17], that the mean scores of these groups would tend to be high on neuroticism and on introversion, as compared with the total mean of the whole sample; it will be seen that with the exception of the thyro-toxicosis group (high on neuroticism, high on extraversion) this is indeed so. All the other groups are below a score of 18 for extraversion, and above a score of 8 for neuroticism.

Are the groups significantly differentiated among themselves with respect to personality? Table 13 and 14 give the *t* tests calculated between each group and all the other groups; it will be seen that a considerable number of significant differences,

TABLE 12.—*E* AND *N* SCORES IN DIFFERENT PSYCHOSOMATIC GROUPS

Disease	Extraversion		Neuroticism		Sample size
	Av.	Var.	Av.	Var.	
1. Bronchial asthma	17.05	33.22	9.15	29.35	185
2. Chronic Bronchitis	17.49	31.24	8.84	26.78	315
3. Spot on lung	16.93	31.97	8.82	30.92	101
4. Pleurisy with fluid on lung	17.68	29.79	8.68	28.79	220
5. Nervous Dyspepsia or nervous stomach	16.63	36.18	9.99	29.99	542
6. Ulcer	17.03	33.57	9.15	28.56	270
7. Colitis	16.75	31.75	10.25	28.75	77
8. Hypertension	17.62	34.27	8.93	29.18	258
9. Heart attack	16.46	31.73	9.70	26.09	104
10. Coronary thrombosis	17.40	35.25	8.78	28.63	78
11. Angina	17.91	36.65	8.19	21.54	42
12. Thyro Toxicosis	19.30	31.8	12.50	20.45	10
13. Sugar Diabetic	17.06	39.37	8.17	27.98	35
14. Lumbago	17.62	30.56	8.72	28.16	1014
15. Sciatica/Neuritis	17.88	30.30	9.25	27.38	500
16. Fibrositis, muscular rheumatism	17.28	37.97	8.94	28.95	1011
17. Rheumatoid arthritis	17.62	26.36	8.88	30.12	99
18. Migraine	16.96	30.34	9.92	28.38	249
19. Continuous nervous headache	16.06	33.74	10.93	33.15	132
20. Nervous headache	16.11	43.02	10.28	32.87	183

both at the 5 per cent and the 1 per cent level, are contained in our sample. Direct comparisons are a little difficult, as the groups differ widely in size (from over 1000 to as little as 10); these differences must be borne in mind in interpreting the results of the *t* tests.

It had been anticipated that persons who had suffered accidents would tend to have extraverted personality scores, as well as having elevated neuroticism means; this was predicted on theoretical grounds, and in addition there is some empirical work tending in that direction [3, 8]. Figures are given in Table 15 to substantiate these anticipations. All the means, with one exception, are above the mean for neuroticism; all the means, with one exception, are on or above the mean for extraversion. The exception, in both cases, is "Other accidents", but the number of cases is only twenty-one; it seems unlikely that this category signifies a real distinction. "Loss of an eye" is the most extraverted group, and "Burns or scalds" the more neurotic. Inspection of the group differences does not disclose any particular principle on the basis of which one might formulate an hypothesis to serve in explanation. (In appraising these and other figures, it would of course be borne in mind that the larger the group which is being compared with the population mean, the nearer its average score will tend to be to that of the population under scrutiny. This follows from the fact that we are comparing a psychosomatic group, *x*, with a total group consisting of *x* and a remainder not suffering from that particular psychosomatic disorder, *y*. The larger a portion *x* is of *x* + *y*, the less likely is *x* to differ from *x* + *y* by any large amount. It would of course be possible to give for comparison in each case the population mean with *x* taken out, but it did not seem that the clarification achieved would justify the added tables required for this purpose.)

TABLE 13.—INDIVIDUAL *t* TESTS BETWEEN DIFFERENT PSYCHOSOMATIC GROUPS: NEUROTICISM*

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1.	0.6233	0.4975	0.8808	1.8459	0	1.5121	0.4254	0.8374	0.5114	1.0476	1.9241	0.9910	1.0031	0.2168	0.4899	0.4044	1.4809	2.9111	2.0182
2.		0	0.3400	<u>3.0326</u>	<u>0.6959</u>	<u>2.0657</u>	<u>0.1992</u>	<u>1.4174</u>	<u>0.0884</u>	<u>0.7376</u>	<u>2.1245</u>	<u>0.7006</u>	<u>0.3457</u>	<u>1.0602</u>	<u>0.2881</u>	<u>0.0647</u>	<u>2.3734</u>	<u>3.7501</u>	<u>2.8788</u>
3.			0.2175	<u>2.0170</u>	<u>0.5277</u>	<u>1.7621</u>	<u>0.1746</u>	<u>1.1751</u>	<u>0.4951</u>	<u>0.6399</u>	<u>2.0699</u>	<u>0.6177</u>	<u>0.1787</u>	<u>0.7350</u>	<u>0.2144</u>	<u>0.0791</u>	<u>1.7398</u>	<u>2.9742</u>	<u>2.1938</u>
4.				<u>3.0776</u>	<u>0.9678</u>	<u>2.2130</u>	<u>0.5086</u>	<u>1.6018</u>	<u>0.1418</u>	<u>0.5431</u>	<u>2.2035</u>	<u>0.5227</u>	<u>0.1007</u>	<u>1.3183</u>	<u>0.6543</u>	<u>0.3086</u>	<u>2.5079</u>	<u>3.8141</u>	<u>2.9835</u>
5.						<u>2.1120</u>	<u>0.3985</u>	<u>2.6180</u>	<u>1.8673</u>	<u>2.0978</u>	<u>1.4669</u>	<u>1.9464</u>	<u>4.4834</u>	<u>2.2384</u>	<u>3.7068</u>	<u>1.8974</u>	<u>0.1714</u>	<u>1.8079</u>	<u>0.6329</u>
6.						<u>1.5872</u>	<u>0.4706</u>	<u>0.8893</u>	<u>0.5371</u>	<u>1.0795</u>	<u>1.9398</u>	<u>1.0168</u>	<u>1.1708</u>	<u>0.2470</u>	<u>0.5718</u>	<u>0.4286</u>	<u>1.6563</u>	<u>3.1224</u>	<u>2.1968</u>
7.							<u>1.8934</u>	<u>0.6822</u>	<u>1.7065</u>	<u>2.0024</u>	<u>1.2481</u>	<u>1.9016</u>	<u>2.4121</u>	<u>1.5225</u>	<u>2.0652</u>	<u>1.6808</u>	<u>0.4719</u>	<u>0.8834</u>	<u>0.0411</u>
8.								<u>1.2357</u>	<u>0.2164</u>	<u>0.8291</u>	<u>2.0652</u>	<u>0.7861</u>	<u>0.5600</u>	<u>0.7768</u>	<u>0</u>	<u>0.0788</u>	<u>2.0769</u>	<u>3.4777</u>	<u>2.5964</u>
9.									<u>1.1462</u>	<u>1.5407</u>	<u>1.5771</u>	<u>1.4597</u>	<u>1.7758</u>	<u>0.7791</u>	<u>1.3771</u>	<u>1.0894</u>	<u>0.3518</u>	<u>0.7488</u>	<u>0.8951</u>
10.										<u>0.5751</u>	<u>2.0654</u>	<u>0.5590</u>	<u>0.0953</u>	<u>0.7204</u>	<u>0.2541</u>	<u>0.1232</u>	<u>1.6400</u>	<u>2.8069</u>	<u>2.0676</u>
11.											<u>2.2841</u>	<u>0.0163</u>	<u>0.6277</u>	<u>1.2306</u>	<u>0.8882</u>	<u>0.6988</u>	<u>1.9348</u>	<u>2.8833</u>	<u>2.2768</u>
12.												<u>2.2515</u>	<u>2.2180</u>	<u>1.8975</u>	<u>2.0889</u>	<u>2.0343</u>	<u>1.4918</u>	<u>0.8925</u>	<u>1.2745</u>
13.													<u>0.5962</u>	<u>1.1512</u>	<u>0.8347</u>	<u>0.6730</u>	<u>1.8073</u>	<u>2.7050</u>	<u>2.1306</u>
14.														<u>1.8074</u>	<u>0.9219</u>	<u>0.2833</u>	<u>3.1676</u>	<u>4.4463</u>	<u>3.6108</u>
15.															<u>1.0571</u>	<u>0.6272</u>	<u>1.6129</u>	<u>3.1973</u>	<u>2.2178</u>
16.																<u>0.1062</u>	<u>2.5869</u>	<u>4.0037</u>	<u>3.1016</u>
17.																	<u>1.6332</u>	<u>2.8732</u>	<u>2.0901</u>
18.																		<u>1.7486</u>	<u>0.6887</u>
19.																			<u>1.0590</u>

* Simple underlining indicates significance at the $p < 0.05$ level; double underlining indicates significance at the $p < 0.01$ level.

TABLE 14.—RESULTS OF *t* TESTS FOR EXTRAVERSION SCALE*

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1.	0.8191	0.1675	1.0931	0.8545	0	0.3818	1.0204	0.8317	0.4479	0.8689	1.1965	0	1.2311	1.6658	0.4967	0.7904	0.1603	1.4991	1.5544
2.		0.8447	0.3738	2.0997	0.9561	1.0038	0.2664	1.5718	0.1228	0.4413	0.9727	0.4163	0.1096	0.9337	0.1771	0.1946	1.0784	2.3756	2.5543
3.			1.0790	0.4788	0.1480	0.2054	1.0141	0.5811	0.5386	0.9216	1.2343	0.1144	1.1415	1.5035	0.5790	0.8423	0	1.1354	1.1408
4.				2.2839	1.2393	1.2137	0.1130	1.7738	0.3675	0.2360	0.8652	0.5883	0.1398	0.4283	0.9320	0.0857	1.3483	2.5426	2.7105
5.					0.9312	0.1703	2.2639	0.2749	1.1002	1.3812	1.4447	0.4258	3.2358	3.5008	2.1245	1.5668	0.7481	1.0150	1.0507
6.			0.3741			1.1684	0.8533	0.4973	0.9162	1.2170	0.0288	1.4874	1.9437	1.9437	0.6302	0.8671	0.1377	1.5754	1.6560
7.						1.1554	0.3330	0.6986	1.0440	1.3096	0.2624	1.2699	1.5929	1.5929	0.7736	0.9883	0.2781	0.8300	0.8758
8.							1.7236	0.2939	0.3008	0.8998	0.5363	0	0.5844	0.5844	0.8394	0	1.2820	2.5115	2.6889
9.								1.0843	1.3698	1.4810	0.5300	1.9461	1.9461	2.2762	1.3757	1.4269	0.7402	0.5266	0.4917
10.									0.4602	0.9767	0.2885	0.3234	0.3234	0.6812	0.1764	0.2510	0.5861	1.6197	1.6463
11.										0.6820	0.6411	0.3180	0.3180	0.0322	0.6909	0.2719	0.9837	1.8024	1.8155
12.											1.0784	0.9127	0.9127	0.7676	1.0974	0.8741	1.2527	1.7053	1.6956
13.												0.5620	0.5620	0.8093	0.2208	0.4915	0.0956	0.9074	0.8882
14.														0.8209	1.3192	0	1.6130	2.9059	3.2360
15.															1.8944	0.4081	2.0505	3.2069	3.5286
16.																0.5574	2.4732	2.2726	3.7932
17.																	0.9596	2.0244	2.0872
18.																		1.4427	1.5056
19.																			0.0754

* Values significant at the 5 per cent level are underlined once, those significant at the 1 per cent level are underlined twice.

TABLE 15.—*E* AND *N* SCORES FOR DIFFERENT ACCIDENT GROUPS

Accident	Extraversion		Neuroticism		Sample size
	Av.	Var.	Av.	Var.	
Fractures	18.21	30.28	8.44	28.83	841
Dislocations	18.22	34.32	8.67	26.25	300
Burns or scalds which need treatment from a doctor	18.41	30.82	9.48	28.86	282
Loss of limb or part of a limb	17.87	20.70	8.75	25.85	71
Loss of an eye	21.29	23.74	8.50	23.39	14
Other accident	17.67	29.82	7.76	19.35	21
Sprains or extensive bruises following an accident which needed treatment by a doctor	17.80	30.51	8.47	27.29	889
Shock or internal bruising following an accident which needed treatment by a doctor	18.38	33.90	8.45	29.51	439
Minor injuries able to treat by self	17.98	32.01	8.27	28.73	1281

8. SUMMARY AND CONCLUSIONS

A population sample of some 3000 respondents, male, aged between 45 and 64, was questioned with respect to smoking habits, psychosomatic disorders, and personality by trained interviewers. It was found that cigarette smoking was related to extraversion, pipe smoking to introversion; neuroticism was not related to smoking but the more neurotic inhaled more. Psychosomatic disorders were most frequent in smokers, in spite of the fact that while smokers were found to be extraverted, sufferers from psychosomatic disorders were found to be introverted. There was also a relationship between psychosomatic disorders and neuroticism. One group of psychosomatic disorders, that of "accidents", was found to be rather extraverted, but still high on neuroticism. Most of these findings are in line with expectation, and corroborate previous findings.

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APPENDIX A

Table A lists the sixty-four questions which constitute the personality questionnaire. Product-moment correlations were calculated between the items for the total sample, and a principal components type factor analysis carried out, in which five factors were retained. An analytic rotation was carried out on the Varimax system, and the resulting factors then rotated into an oblique solution. As the items had been chosen with certain specific hypotheses in mind, and on the basis of many previous factor analyses and rotations of similar material, it was decided to base these rotations on the so-called "Procrustes" method of Cattell [1]. In this method a "pattern matrix" is prepared in which positive and negative loadings for each item on the various factors are prescribed according to the underlying hypothesis of the investigator; rotation is then carried out automatically by the machine to give maximum agreement between the empirical figures and the theoretical constellation. If the underlying theory is wrong, agreement is inevitably poor; good agreement suggests that the theory is not untenable, to say the least.

TABLE 16.—FACTOR LOADINGS FOR PERSONALITY QUESTIONNAIRE

	N	E	R	S	I	N	E	R	S	I	
1	0.54	0.06	-0.04	0.06	-0.03	33	0.40	0.10	-0.05	0.01	0.09
2	0.12	0.45	0.23	0.33	0.06	34	-0.01	-0.40	-0.35	-0.26	-0.00
3	-0.10	0.23	0.04	0.09	0.05	35	0.01	-0.43	-0.22	-0.34	-0.06
4	0.02	0.42	0.17	0.24	0.06	36	0.37	-0.16	-0.03	0.26	-0.01
5	0.06	0.27	0.10	0.07	0.05	37	0.13	0.37	0.11	-0.02	0.45
6	0.49	0.04	0.08	0.02	-0.02	38	0.34	0.02	-0.16	-0.13	0.19
7	0.24	0.38	0.27	0.26	-0.10	39	0.21	0.42	-0.02	-0.01	0.59
8	-0.01	0.22	0.20	-0.07	0.17	40	-0.08	-0.44	0.11	-0.06	-0.68
9	0.43	-0.07	0.05	-0.12	-0.05	41	0.48	-0.04	-0.06	-0.01	0.06
10	0.04	-0.50	0.05	0.59	-0.03	42	-0.09	0.17	0.38	0.05	-0.12
11	0.15	-0.29	0.00	-0.28	-0.07	43	-0.05	-0.31	-0.17	-0.25	-0.05
12	0.23	0.20	-0.12	0.04	0.27	44	0.41	0.01	0.08	0.17	-0.16
13	0.49	0.13	0.12	-0.02	-0.01	45	0.12	0.47	0.30	0.20	0.07
14	0.38	0.34	0.11	0.15	0.11	46	0.51	0.14	0.34	0.07	-0.28
15	0.05	0.16	0.23	-0.03	-0.05	47	0.11	-0.17	-0.19	-0.20	0.02
16	0.30	-0.11	-0.20	-0.14	0.10	48	0.06	0.25	0.54	-0.04	0.00
17	0.50	0.01	-0.14	-0.05	0.12	49	0.57	0.01	0.01	0.01	-0.09
18	-0.06	-0.33	-0.02	0.36	-0.06	50	0.11	-0.47	0.05	-0.60	-0.05
19	0.53	0.09	-0.07	0.07	0.05	51	0.36	-0.02	0.16	-0.20	0.00
20	0.15	-0.40	0.10	-0.51	-0.05	52	-0.01	-0.34	-0.24	-0.19	-0.12
21	0.05	-0.29	0.32	-0.22	-0.40	53	0.44	-0.04	-0.26	0.09	-0.08
22	0.48	0.05	0.10	0.03	0.10	54	-0.02	-0.16	0.04	-0.17	-0.20
23	0.05	-0.25	0.10	-0.24	-0.12	55	0.41	0.05	-0.19	0.16	-0.03
24	0.54	0.03	0.04	0.07	-0.15	56	-0.08	0.21	-0.05	0.23	-0.06
25	0.04	0.03	0.03	0.06	-0.18	57	0.41	-0.02	-0.04	-0.16	0.08
26	0.06	-0.49	0.06	0.54	-0.02	58	0.50	0.01	-0.10	-0.03	0.06
27	0.54	0.03	-0.09	0.03	0.01	59	0.34	0.17	-0.04	0.05	0.10
28	0.09	-0.41	0.15	-0.56	-0.04	60	0.11	0.19	0.04	0.14	-0.04
29	0.34	0.03	0.23	-0.20	0.07	61	-0.02	-0.19	-0.15	-0.14	0.06
30	0.43	-0.11	-0.23	0.01	-0.09	62	0.13	0.48	0.23	0.33	-0.02
31	0.06	-0.39	0.22	0.17	-0.26	63	-0.07	-0.38	-0.19	-0.33	0.03
32	0.15	0.31	0.55	0.01	0.10	64	-0.01	0.09	0.24	-0.02	-0.07

TABLE A

	Smoking	
	Heavy and Medium vs. Non and Pipe	Key
1. Do you sometimes feel happy, sometimes depressed without any apparent reason?	+	(N)
2. Do you usually take the initiative in making new friends?	+	(S)
3. Are you inclined to be quick and sure in your actions?	+	(E)
4. Would you rate yourself a lively individual?	+	(E)
5. Are you happiest when you get involved in some project that calls for rapid action?	+	(N)
6. Does your mind often wander while you are trying to concentrate?		(S)
7. Would you be very unhappy if you were prevented from making numerous social contacts?		(IMP)
8. Do you prefer action to planning for action?	+	(N)
9. Are you frequently "lost in thought" even when supposed to be taking part in a conversation?		S
10. Are you inclined to keep in the background on social occasions?		S
11. Is it difficult to "lose yourself" even at a lively party?	-	(N)
12. Do you sometimes slam doors when you are angry?	+	(E)
13. Are you sometimes bubbling over with energy and sometimes very sluggish?		(IMP)
14. Do you often crave excitement?		(N)
15. Do you like to keep moving round and doing things most of the time?		S
16. Do you usually expect the worst to happen?		(N)
17. Are you inclined to be moody?		S
18. Would you rather spend an evening by yourself than go to a dull party?		(N)
19. Do you have frequent ups and downs in mood, either with or without apparent cause?		(N)
20. Does your natural reserve generally stand in your way when you want to start a conversation with an attractive stranger of the opposite sex?		S
21. Do you usually avoid "sticking your neck out"?		IMP
22. Are your daydreams frequently about things that can never come true?		(N)
23. Would you feel uncomfortable in anything other than fairly usual dress?		(N)
24. Are you inclined to ponder over your past?		(N)
25. Do you like to try your wits in solving puzzles?		S
26. Are you inclined to limit your acquaintances to a select few?		(N)
27. Do you ever feel "just miserable" for no good reason at all?		S
28. Are you inclined to be shy in the presence of the opposite sex?		(N)
29. Do you often find that you have made up your mind too late?		(N)
30. Have you often lost sleep over your worries?		(N)
31. Is your motto to take matters of everyday life with proper seriousness rather than "to laugh and be merry"?		IMP
32. Do you enjoy practical jokes?		(E)
33. Are you often troubled with feelings of guilt?		(N)

TABLE A (contd.)

	Smoking	
	Key — Heavy and Medium vs. Non and Pipe	
34. Do you hate being with a crowd who play jokes on one another?	E	
35. On the whole, do you prefer the company of books to people?	E (N)	
36. Are your feelings rather easily hurt?	(IMP)	
37. Do you sometimes say the first thing that comes into your head?	(N)	
38. Would you rate yourself as a tense or "highly-strung" individual?	(IMP)	
39. Are you given to acting on impulses of the moment which later land you into difficulties?	IMP	—
40. Are you inclined to stop and think things over before acting?		
41. Do you often experience periods of loneliness?		
42. Do you usually expect the best to happen?		
43. Do you like working alone?		
44. Do you like to indulge in reverie (daydreaming)?	E	—
45. Do you like a situation with plenty of excitement and bustle?	(N)	
46. Do you spend much time in thinking over good times you have had in the past?	(E)	
47. Do you ever take your work as if it were a matter of life or death?	(N)	
48. Would you describe yourself as an easy-going person not concerned to be precise?	E	+
49. Have you often felt listless and tired for no good reason?	(IMP)	+
50. Are you reserved and distant except to intimate friends?	(N)	
51. After a critical moment is over, do you usually think of something you should have done, but failed to do?	S	
52. If you want to learn about something, would you rather do it by reading a book on the subject than by discussion?	(N)	
53. Do ideas run through your head so that you cannot sleep?	E	
54. Do you like work that requires considerable attention?	(N)	
55. Have you ever been bothered by having a useless thought come into your head repeatedly?	(N)	
56. Can you put your thoughts into words quickly?	N	
57. Are you touchy on various subjects?	(N)	
58. Do you often feel disgruntled?	(N)	
59. Do you have periods of such great restlessness that you cannot sit long in a chair?	(N)	
60. Do you like to try unusual dishes?	(E)	
61. Do you mind selling things, or trying to get funds for a cause in which you are interested?	(N)	
62. Can you readily get some life into a rather dull party?	E	—
63. Are you a person who is not much given to cracking jokes and telling stories to your friends?	(S)	
64. Do you very much enjoy good food?	S	
	(E)	

N = Neuroticism E = Extraversion S = Sociability IMP = Impulsiveness Bracketted letters = Yes.

It was postulated that the five factors to emerge would be: Neuroticism, Extraversion, Rhathymia, Sociability and Impulsiveness. Table 16 shows the correlations of the items with the reference vectors; items underlined are those which were selected on *a priori* grounds to form the "pattern matrix"; it will be seen that agreement is very nearly perfect. Rhathymia is the least well defined factor, and there can be little confidence about its identification; we have therefore not used this factor in our main investigation, and have not scored it. The other factors are quite clear-cut, and in good agreement with previous studies; considerable confidence is therefore felt in naming and scoring these factors.

Table 17 gives the correlations between the reference vectors. As expected, sociability and impulsiveness correlate well with Extraversion, Rhathymia does too, but less well. There is an unexpected correlation of 0.25 between extraversion and neuroticism. (It must, of course, be remembered that the correlations between reference vectors are not identical with the correlations which would be obtained between scores based on the factors.) It might be objected that this analysis mixes up in one plane first-order factors and second-order factors. Such an objection leaves out of account that there cannot in the nature of the case be any clear distinction between "orders", making an absolute distinction between two classes. Factors are more or less inclusive, along a continuum, and the division between first- and second-order factors is largely of heuristic importance. Mathematically there is no obvious argument against including factors such as the ones used here, in one analysis.

TABLE 17.—CORRELATIONS BETWEEN REFERENCE VECTORS

	N	E	R	S	I
N	1.00000	0.25089	0.16532	0.23357	-0.24993
E	0.25089	1.00000	0.24869	0.69989	0.37832
R	0.16532	0.24869	1.00000	-0.12050	-0.34231
S	0.23357	0.69989	-0.12050	1.00000	-0.06646
I	-0.24993	0.37832	-0.34231	-0.06646	1.00000

APPENDIX B

Psychosomatic Questionnaire

We now come to some questions on general health. Would you call yourself a very healthy person, moderately healthy or not as healthy as you'd like? A very healthy person B
Moderately healthy A
Not as healthy as would like 0
Other answer (specify) 1

There are certain illnesses or conditions which more people seem to get nowadays. We're interested in these illnesses and I'd like to go over a list of them with you and ask if you've ever had any of them.

7(a) *Respiratory troubles come first.* Have you ever been troubled with:

	Yes	No	Other answers (specify)
Hay fever, catarrh, or frequent running nose when you haven't a cold?	B	A	0
Bronchial asthma?	1	2	3
Chronic bronchitis?	4	5	6
A spot on the lung?	B	A	0
Pleurisy with fluid in the lung?	1	2	3

- (b) *Coughs*. Now there are special questions about coughing. Do you usually cough first thing in the morning (on getting up) in the winter? I don't mean just a single cough or clearing your throat.
- | | |
|------------------------------|---|
| Yes | 4 |
| No | 5 |
| Other answer (specify) | 6 |
- N.B. i. If dealing with night worker use bracketed phrase.
ii. Count 'cough with first smoke' or 'on first going out of doors'.
- (c) Do you do this in the summer?
- | | |
|------------------------------------|---|
| Yes | B |
| Yes, but less than in winter | A |
| No | 0 |
| Other answer (specify) | 1 |
- (d) Do you usually cough during the day or at night during the winter? (Ignore occasional cough)
- | | |
|------------------------------|---|
| Yes | 3 |
| No | 4 |
| Other answer (specify) | 5 |
9. *Stomach and gastric troubles come next*. Do you or have you suffered at all from nervous dyspepsia or a nervous stomach?
- | | |
|------------------------------|---|
| Yes | B |
| No | A |
| Other answer (specify) | 0 |
- (i) Have you ever had an ulcer?
- | | |
|------------------------------|---|
| Yes | 2 |
| No | 3 |
| Other answer (specify) | 4 |
- (ii) If "Yes" to (i): Was it a gastric, duodenal, peptic or stomach ulcer?
- | | |
|------------------------------|---|
| Gastric | B |
| Duodenal | A |
| Peptic | 0 |
| Stomach ulcer | 1 |
| Other answer (specify) | 2 |
- (iii) Have you ever had colitis?
- | | |
|------------------------------|---|
| Yes | 4 |
| No | 5 |
| Other answer (specify) | 6 |
- (iv) If "Yes" to (iii): Was this ulcerative colitis or mucous colitis?
- | | |
|------------------------------|---|
| Ulcerative colitis | B |
| Mucous colitis | A |
| Other answer (specify) | 0 |
10. *Now heart conditions*. Do you or have you ever suffered from:
- (i) Hypertension (that is, high blood pressure)?
- | | |
|------------------------------|---|
| Yes | 2 |
| No | 3 |
| Other answer (specify) | 4 |
- (ii) A heart attack of any kind?
- | | |
|------------------------------|---|
| Yes | 6 |
| No | 7 |
| Other answer (specify) | 8 |
- (iii) Coronary thrombosis, that is, a blood clot in the heart?
- | | |
|------------------------------|---|
| Yes | B |
| No | A |
| Other answer (specify) | 0 |

(iv) Angina?	Yes	2
	No	3
	Other answer (specify)	4
11(a) <i>Next some general disorders.</i> Do you or have you ever had any trouble with your thyroid?	Yes	7
	No	7
	Other answer (specify)	8
(b) If "Yes": Was it thyrotoxicosis, exophthalmic goitre or a simple goitre?	Thyrotoxicosis	B
	Exophthalmic goitre	A
	Simple goitre	0
	Other answer (specify)	1
(c) Are you diabetic (that is a sugar diabetic)?	Yes	B
	No	A
	Other answer (specify)	0
12. <i>Now rheumatic conditions.</i> Do you or have you ever suffered from:		
(i) Lumbago?	Yes	2
	No	3
	Other answer (specify)	4
(ii) Sciatica or neuritis?	Yes	6
	No	7
	Other answer (specify)	8
(iii) Fibrositis or muscular rheumatism?	Yes	B
	No	A
	Other answer (specify)	0
(iv) Rheumatoid arthritis?	Yes	2
	No	3
	Other answer (specify)	4
13. <i>Next headaches and nervous troubles.</i> Do you or have you ever suffered from:		
(i) Migraine?	Yes	6
	No	7
	Other answer (specify)	8
(ii) Continual nervous headaches?	Yes	B
	No	A
	Other answer (specify)	0
(iii) Nervous debility	Yes	B
	No	A
	Other answer (specify)	0

- | | | |
|---|---|---|
| (iv) Neurasthenia? | Yes | 2 |
| | No | 3 |
| | Other answer (specify) | 4 |
| 14. <i>Skin conditions next.</i> Do you or have you ever had trouble over: | | |
| (i) Acne or blackheads? | Yes | 6 |
| | No | 7 |
| | Other answer (specify) | 8 |
| (ii) Dermatitis? | Yes | B |
| | No | A |
| | Other answer (specify) | 0 |
| (iii) If has had, ask: Was a cause found for it, for example, a chemical irritant at work or at home? | Yes | 2 |
| | No | 3 |
| | Other answer (specify) | 4 |
| (iv) If irritant: What was the irritant? | | |
| (v) Neurodermatitis or dermatitis due to nerves? | Yes | 6 |
| | No | 7 |
| | Other answer (specify) | 8 |
| (vi) Nettle rash (this is also called urticaria)? | Yes | B |
| | No | A |
| | Other answer (specify) | 0 |
| (vii) Eczema? | Yes | 2 |
| | No | 3 |
| | Other answer (specify) | 4 |
| (viii) Psoriasis? | Yes | 6 |
| | No | 7 |
| | Other answer (specify) | 8 |
| 15(a) <i>Now accidents.</i> Have you ever had any of the following: | | |
| | Fractures | B |
| | Dislocations | A |
| | Burns or scalds which have needed treatment from a doctor | 0 |
| | Loss of a limb or part of a limb | 1 |
| | Loss of an eye | 2 |
| | None of these | 3 |
| | Other answer (specify) | 4 |
| (b) Have you ever had any sprains or extensive bruises following an accident which have needed treatment by a doctor? | Yes | 6 |
| | No | 7 |
| | Other answer (specify) | 8 |
| (c) And have you ever had treatment from a doctor because of shock or internal bruising or some other sort of condition following an accident of some kind? | Yes | B |
| | No | A |
| | Other answer (specify) | 0 |

(d) If has had any of the above (Q 15a, b, c) ask: Was the accident you had at home, at work, in the street or what?	At home	2
	At work	3
	In the street	4
	Other answer (specify)	5
(e) If motor accident: Were you involved in this accident as a driver, a passenger or a pedestrian?	A driver	B
	A passenger	A
	A pedestrian	0
	Other answer (specify)	1
(f) Just during the last year or two, have you had any minor injuries like cuts, bruises and so on, either at work or at home that you were able to treat yourself?	Yes	3
	No	4
	Other answer (specify)	5