

PSYCHOSOCIAL PERSONALITY TRAITS AND CIGARETTE SMOKING AMONG BRONCHIAL CARCINOMA PATIENTS

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SUMMARY

In a multicentre study, the Eysenck personality questionnaire (EPQ) was administered to patients in the diagnostic process for lung diseases, who later on turned out to have lung cancer or other chest diseases. The study was controlled by a group of healthy persons. The most important results of the survey are relatively low values for extraversion in the carcinoma group (BCA) and relatively high scale values for extraversion both in the healthy (GKG) and in the sick (KKG) control groups. Higher neuroticism scale values are shown by younger carcinoma patients (BCA) in comparison with healthy (GKG) and patient control group persons (KKG). However, psychotocism scale values show just small differences between BCA on the one hand and the control groups (GKG and KKG) on the other. Finally the authors discuss whether the results of the study are more supportive of Cooper's stress hypothesis than of Eysenck's constitutional hypothesis as explanation for an important partial cause of carcinogenesis.

KEY WORDS—Bronchial carcinoma, cigarettes, personality traits, Eysenck Personality Questionnaire, extraversion, neuroticism.

Several hypotheses exist about the importance of psychosocial influences on the origin and course of carcinomas.¹⁻⁹ The inability of carcinoma patients to displace emotional tensions in an appropriate way has been described as commonplace by numerous researchers.^{7, 10-13}

In the aetiology of bronchial carcinoma, special importance is attached to exogenous noxae, e.g. inhaled cigarette smoking, as a carcinogenic factor. Increasingly, attention is being paid to work-related exposure as an etiological factor for bronchial carcinoma.^{14, 15}

PREVIOUS STUDIES

Although numerous authors accept that there is a causal connection between cigarette smoking and the genesis of bronchial carcinoma, other scientists do not consider this hypothesis as proven. Eysenck, for example, in his 1980 and 1986 papers,^{16,17} raises several objections to the theory of a causal connection between cigarette smoking and bronchial carcinogenesis:

- The connection between lung cancer and cigarette smoking is relatively weak compared internationally;
- The change in the death rate due to lung cancer is not parallel to changes in smoking habits in this century;

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- Lung cancer diagnosis was a very uncertain affair at the beginning of this century, so that data published at that time cannot be regarded as a valid statistical base for an increase in frequency in the course of time;
- Even today lung cancer diagnosis is still so unreliable that epidemiological data do not provide a reliable basis for correlation and comparisons;
- In the search for a dosage–result relation there have been remarkable discrepancies;
- The inhalation of cigarette smoke does not usually induce a higher incidence of lung cancer, indeed, has often correlated negatively with incidence;
- Non-smoking and/or smoking cessation does not guarantee protection against lung cancer.

These objections to a causal hypothesis have also been supported by Burch.^{18,19}

On the basis of a behaviouristic personality model, Eysenck developed the hypothesis that the origin of lung cancer, as well as smoking habits, is partly conditioned by personality in its constitutional and therefore genetic aspects (constitutional hypothesis).

Personality measures

To measure these constitutionally and genetically determined dimensions of personality, Eysenck and Eysenck developed the Maudsley Personality Inventory (MPI), and later the Eysenck Personality Questionnaire (EPQ).^{20,21} This psychometric test instrument measures the following personality dimensions independent of each other:

- Extraversion – introversion;
- Neuroticism – stability;
- Psychoticism – ego control.

Research using these methods brought the following results:^{11,16}

- In nearly all studies, smokers show increased extraversion values;
- Cigarette smoking is related to a number of behavioural patterns which are characteristic for extraverts;
- Smoking women show, in many case studies, increased neuroticism scale values;
- Lung cancer patients show increased extraversion scale values in some research studies;
- In nearly all research studies, lung cancer patients show low neuroticism values; these

results are more difficult and more complex to interpret, however;

- Cancer patients show some results which indicate a low stimulation threshold as far as extraverted behaviour is concerned.²²

In 1985 Eysenck published a summary of the research results on the problems of relating personality, cancer and cardiovascular diseases.

To test the hypotheses put forward by Eysenck using the MPI and the EPQ, the design for a new research study was developed using the EPQ. The most important results of this epidemiological cross-sectional study are presented here.

SUBJECT DATA

Patients

During the test period June 1981–June 1983, 1261 male patients were investigated by means of questionnaires in four special lung clinics in the Federal Republic of Germany and in one Austrian clinic. Two hundred and forty-eight of these patients had primary bronchial carcinoma and were included in the test group (BCA). In all bronchial carcinoma patients, the researchers took over the histopathological findings from the patients' files and documented them on the diagnosis sheet. From the remaining 1015 patients, a control group of bronchially diseased patients (KKG) was formed. These 298 patients had either the diagnosis bronchial asthma ($n=61$), or chronic bronchitis ($n=164$), or further bronchial complaints (but not sarcoidosis or tuberculosis) ($n=73$).

Healthy control group

The second control group consisted of 312 apparently healthy men (GKG), who came from the same geographical regions as the patients.

The age index of the carcinoma patients showed the well-known clustering between ages 50 and 60. The control groups of bronchially diseased patients and healthy persons were selected in equivalent proportion for age group and social class as the bronchial carcinoma patients.

Smokers and non-smokers

All those in groups BCA, KKG and GKG were designated smokers, who smoked regularly at the time of testing or who had given up smoking less than five years before. As those persons who had

Table 1—Number of cigarettes per day smoked by people in the carcinoma group (BCA), the diseased control group (KKG) and the healthy group (GKG)

| | No. of cigarettes a day | | | | |
|--------------------------|-------------------------|-----|-------|------------|----------------|
| | None | 1-9 | 10-19 | 20 or more | No information |
| BCA (<i>n</i> = 194) | 26 | 14 | 26 | 79 | 49 |
| GKG (<i>n</i> = 255) | 153 | 17 | 32 | 38 | 15 |
| KKG (<i>n</i> = 298) | 111 | 25 | 36 | 64 | 62 |

given up smoking for more than five years could not be included in either the group of smokers or the group of non-smokers, they were not taken into consideration in the consequent evaluation. Thus, the total number of BCA patients was reduced from 248 to 194, the KKG control group from 483 to 298 and the GKG control group from 312 to 255. Non-smokers are thus people who had never smoked.

Table 1 shows the number of cigarettes smoked per person per day in the test group and the control groups.

STUDY DESIGN

Questionnaire

The questionnaire was composed of more than 200 individual questions, organized in several parts: demographic information, EPQ test and information concerning smoking habits. The 110 questions of the EPQ form the core of the questionnaire. From these questions, the dimensions extraversion, neuroticism, psychoticism and social desirability can be determined. The latter has the function of a test dimension (lie score).

Reliability and validity data on the EPQ are available from Eysenck and Eysenck.²¹ The reliability of the German language version of the EPQ in the Federal Republic of Germany is also available.²³

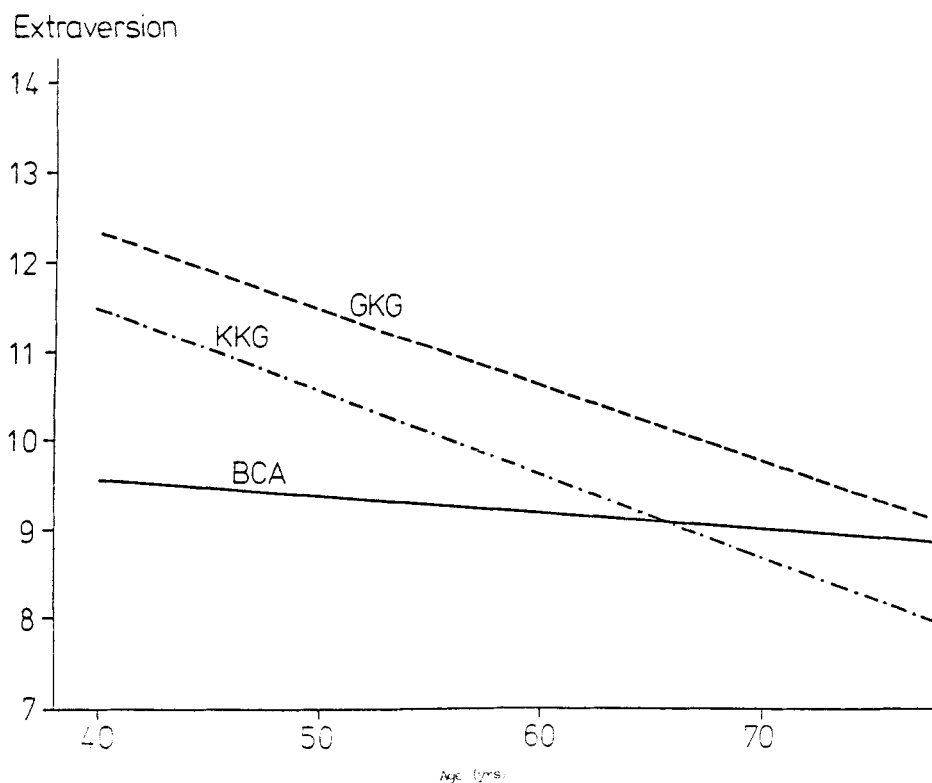


Fig. 1—Age correlation of the extraversion scale value in the carcinoma group (BCA, *n* = 194), the patient control group (KKG, *n* = 298) and the healthy control group (GKG, *n* = 255). Males

Conducting the survey

A total of 261 questionnaires were answered by patients of special lung clinics and afterwards evaluated. The survey in the special lung clinics and among the control groups was organized by the employees of the Institute of Social and Occupational Medicine of Heidelberg University Hospital. All subjects filled in the questionnaire themselves. The data were collected and stored in accordance with the regulations concerning data protection applicable in the Federal Republic of Germany. The examination of the quality of answers showed that 90 per cent of all subjects questioned had answered all but 10 of the 110 questions of the EPQ.

Statistical analysis

Age dependency of the scale values of extraversion, psychoticism, neuroticism and the dimension social desirability in the individual groups was checked by means of regression analyses, based in each case on a significance level of 5 per cent. To test differences between the scale averages for extraversion, psychoticism and neuroticism in the various groups, analyses of variance were carried out. By means of plotting, sufficient homogeneity and normal distribution of variances could be established in the groups.

RESULTS

Regression analyses

The age correlation of components E, N and P were examined separately for each group (BCA,

GKG, KKG) by means of regression analysis. The difference in regression line gradients was calculated and tested for significance. A linear formulation was selected for the analysis.

Extraversion scale values

All three regression lines decline with increasing age. The patient control group and, even more pronounced, the healthy control group show noticeably higher scale values in the lower age groups than the carcinoma group. The regression line gradient in the carcinoma group is noticeably smaller than in the two control groups (Fig. 1).

The difference in gradient of the regression lines between the carcinoma group and the healthy control group per year amounts to $b = +0.064$ and is significant at $p = 0.0$. The regression analysis of the E-scale value in correlation with age for the patient control group produced similar results. The difference from the carcinoma group, however, is not significant (Table 2).

Neuroticism scale values

In the carcinoma group and in the patient control group we obtained declining gradients, whereas in the healthy control group a slight increase can be observed. Neither of the values is significant. Only the difference in the regression coefficient between the carcinoma group and the healthy control group is significant (Fig. 2; Table 3).

Psychoticism scale values

With age, the regression lines decline slightly but not significantly in all three groups. Between the

Table 2—Regression analysis of the extraversion scale (E) against age for the carcinoma group (BCA), the healthy control group (GKG) and the patient control group (KKG)

| Extraversion | Constant <i>a</i> | Regression coefficient <i>b</i> | <i>t</i> -value | <i>p</i> |
|-------------------------------|----------------------|---------------------------------------|-----------------|----------|
| BCA (<i>n</i> = 194) | 10.4 | -0.021 | 0.726 | 0.468 NS |
| GKG (<i>n</i> = 255) | 16.0 | -0.085 | 3.130 | 0.002 + |
| Diff. as compared with BCA | - 5.6 | +0.064 | 2.051 | 0.043 + |
| KKG (<i>n</i> = 298) | 15.0 | -0.088 | 2.880 | 0.004 + |
| Diff. as compared with BCA | - 4.6 | +0.067 | 1.460 | 0.163 NS |

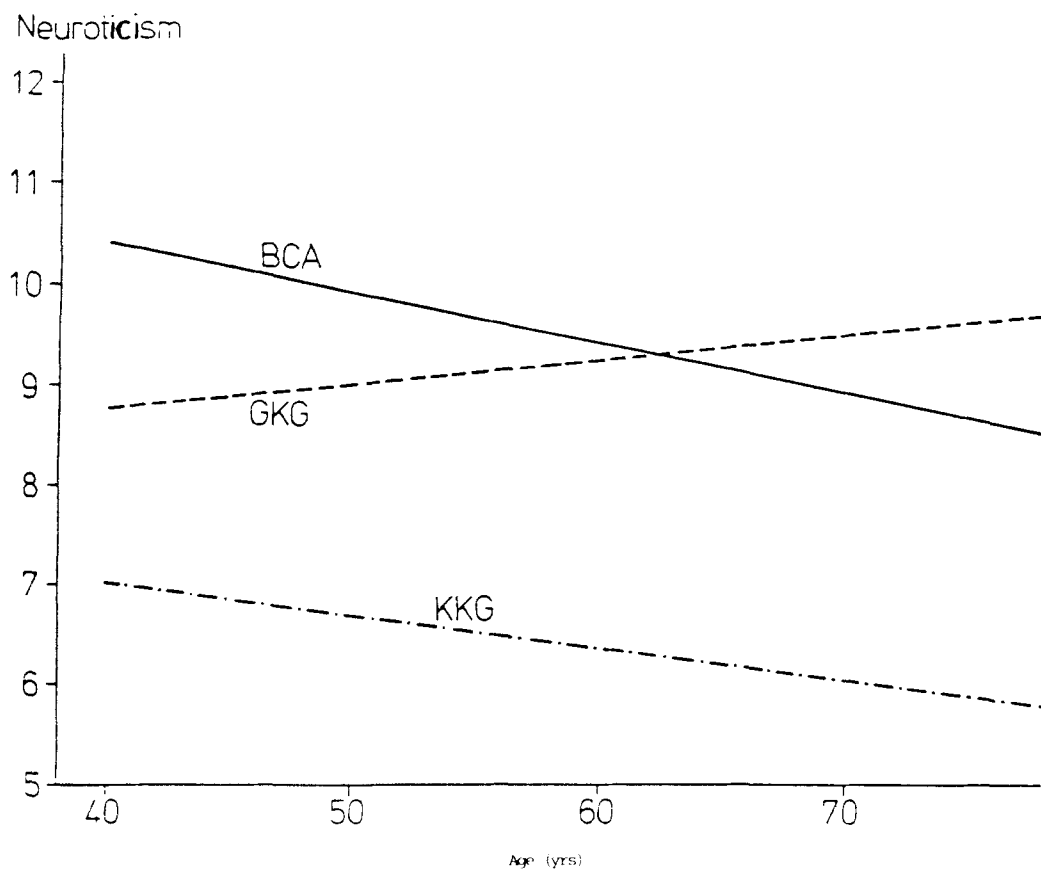


Fig. 2—Age correlation of the neuroticism scale scores in the carcinoma group (BCA, $n = 194$), the patient control group (KKG, $n = 298$) and the healthy control group (GKG, $n = 255$) Males

Table 3—Regression analysis of the neuroticism scale (N) against age for the carcinoma group (BCA), the healthy control group (GKG) and the patient control group (KKG)

| Neuroticism | Constant <i>a</i> | Regression coefficient <i>b</i> | <i>t</i> -value | <i>p</i> |
|-------------------------------|----------------------|---------------------------------------|-----------------|----------|
| BCA ($n = 194$) | 12.5 | -0.052 | 1.930 | 0.055 NS |
| GKG ($n = 255$) | 7.7 | 0.025 | 1.061 | 0.290 NS |
| Diff. as compared with BCA | 4.8 | -0.077 | 3.632 | 0.001 + |
| KKG ($n = 298$) | 8.2 | -0.030 | 0.990 | 0.322 NS |
| Diff. as compared with BCA | 4.3 | -0.022 | 0.490 | 0.655 NS |

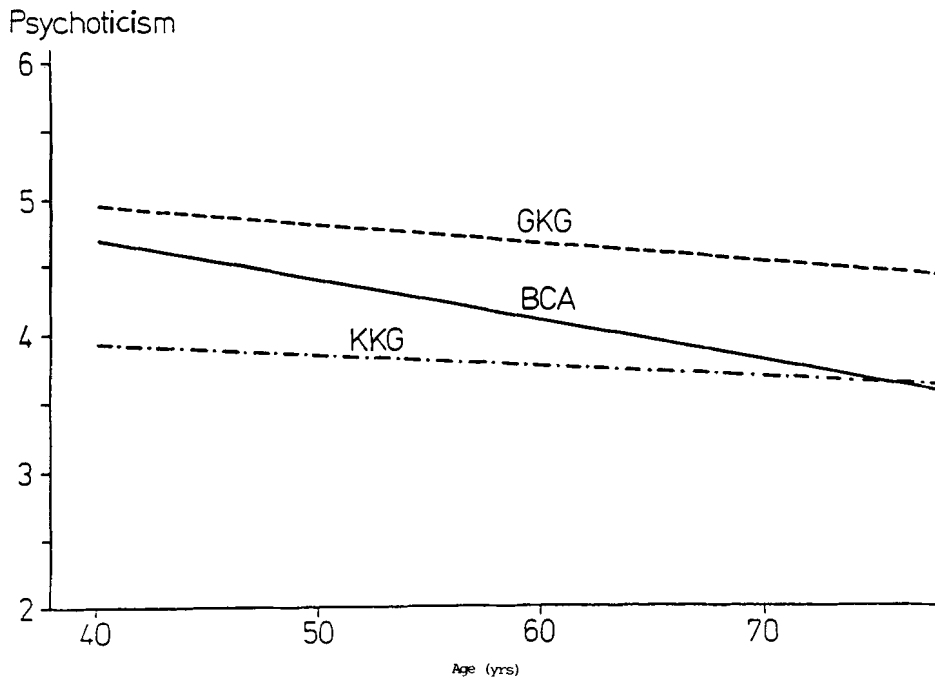


Fig. 3 — Age correlation of the psychoticism scale scores in the carcinoma group (BCA, $n = 194$), the patient control group (KKG, $n = 298$) and the healthy control group (GKG, $n = 255$). Males

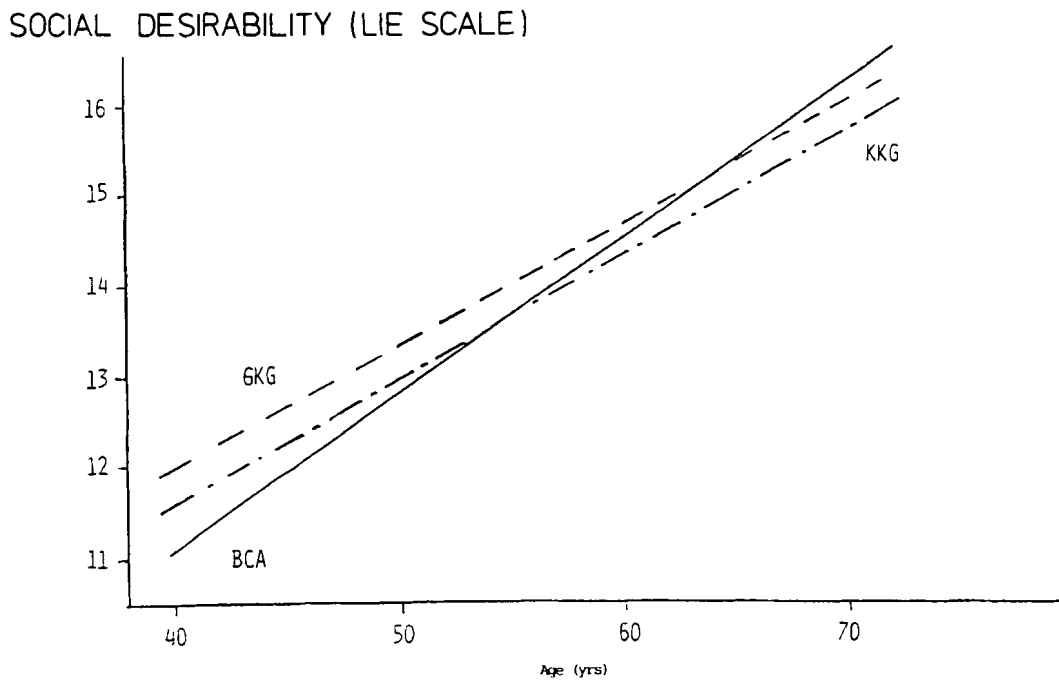


Fig. 4 — Age correlation of the scale scores of social desirability in the carcinoma group (BCA, $n = 194$), the patient control group (KKG, $n = 298$) and the healthy control group (GKG, $n = 255$). Males

Table 4—Mean averages of the scales E, N and P for smokers and non-smokers of the carcinoma group (BCA), the healthy control group (GKG) and the patient control group (KKG) in the different age groups

| Age (yr) | Smokers | | | Non-smokers | | |
|---------------------|---------|-------|-------|-------------|-------|-------|
| | BCA | GKG | KKG | BCA | GKG | KKG |
| <i>Extraversion</i> | | | | | | |
| -40 | 9.60 | 14.00 | 13.00 | 9.00 | 12.86 | 11.17 |
| -50 | 10.29 | 11.76 | 10.41 | 11.80 | 12.08 | 10.87 |
| -60 | 8.77 | 11.02 | 9.84 | 9.50 | 11.77 | 10.57 |
| -70 | 8.77 | 8.42 | 8.60 | 9.33 | 9.78 | 9.56 |
| 70 and more | 9.38 | 9.33 | 9.50 | 8.25 | 10.59 | 7.77 |
| <i>Neuroticism</i> | | | | | | |
| -40 | 10.80 | 9.67 | 10.75 | 12.00 | 8.14 | 9.33 |
| -50 | 11.11 | 9.28 | 10.38 | 6.80 | 9.11 | 8.58 |
| -60 | 9.67 | 8.72 | 11.76 | 8.83 | 6.77 | 9.68 |
| -70 | 8.55 | 10.96 | 9.33 | 9.13 | 10.55 | 10.25 |
| 70 and more | 9.08 | 6.92 | 10.50 | 5.25 | 9.18 | 9.77 |
| <i>Psychoticism</i> | | | | | | |
| -40 | 6.30 | 2.83 | 5.29 | 4.00 | 4.29 | 3.78 |
| -50 | 5.07 | 4.68 | 4.58 | 5.00 | 5.47 | 3.75 |
| -60 | 3.75 | 5.13 | 4.26 | 3.33 | 4.33 | 3.46 |
| -70 | 3.93 | 5.16 | 3.67 | 3.78 | 4.49 | 3.52 |
| 70 and more | 3.92 | 3.64 | 4.90 | 3.25 | 4.50 | 2.55 |

increases of the carcinoma group and the control groups there are no differences (Fig. 3).

Dimension social desirability

The scale values show a noticeable and equally significant age correlation ($p = 0.001$, Fig. 4) for all three groups BCA, GKG, KKG. This means, firstly, that the willingness to answer questions frankly declines with increasing age and, secondly, that the individual values for extraversion, neuroticism and psychoticism can be evaluated equally as far as their credibility is concerned.

Variance analyses

Using the means of the scale E, N and P shown in Table 4, analyses of variance were calculated to determine the effect of age, smoking habits and morbidity on these components.

One can deduce from Table 5 that age is a significant dimension for the components extraversion and psychoticism. Smoking habits also have a significant influence on the dimension psychoticism. As Table 6 shows, no significant differences between the mean averages in the individual groups, with one exception, can be found as far as

Table 5—Significance level (p) of the differences between the mean averages of E, N and P for the dimensions age, smoking habits and morbidity in the carcinoma group (BCA) and the patient control group (KKG)

| Dimensions | Extraversion | Neuroticism | Psychoticism |
|----------------|--------------|-------------|--------------|
| | p | p | p |
| Age | 0.040* | 0.294 | 0.003* |
| Smoking habits | 0.961 | 0.184 | 0.023* |
| Morbidity | 0.122 | 0.155 | 0.313 |

*Statistically significant, $p = 0.05$

Table 6—Significance level of the differences between the mean averages of E, N and P for the dimensions age, smoking habits and morbidity in the carcinoma group (BCA) and the healthy control group (GKG)

| Dimensions | Extraversion <i>p</i> | Neuroticism <i>p</i> | Psychoticism <i>p</i> |
|----------------|--------------------------|-------------------------|--------------------------|
| Age | 0.015* | 0.140 | 0.139 |
| Smoking habits | 0.113 | 0.152 | 0.756 |
| Morbidity | 0.412 | 0.655 | 0.305 |

*Statistically significant, $p = 0.05$

the components E, N and P are concerned. There is only a significant difference for extraversion and age.

DISCUSSION

The most important result of the study is the fact that the carcinoma group, with its relatively low values, and the control groups with their relatively high scale values for extraversion, are clearly distinguishable from one another at a younger age (Fig. 1). A comparison shows that the mean averages of the standardization group (TNG) of the EPQ²⁷ are very similar to those of the healthy control group (GKG).

Younger carcinoma patients (BCA) have a higher neuroticism scale value compared with the healthy (GKG) and the patient (KKG) control groups. The psychoticism scale values, on the other hand, show only slight differences between BCA and the two control groups GKG and KKG.

Thus, compared with the healthy and patient control groups, our younger bronchial carcinoma patients describe themselves as:

- Less sociable, less related to many friends or people to talk to, less willing to take risks, less capable of acting spontaneously or impulsively and less interested in change or movement, and more prepared to react aggressively or to lose self-control;
- Positively formulated, the younger BCA patients are more prepared to keep their emotions under stricter control and to behave predictably and reliably in comparison with the younger control group;
- They consider themselves more often timid and worried without telling others about this;

— Their stronger adaption efforts interfere more frequently with their reactions and make them react rigidly more often than the control patients in groups GKG and KKG.

Conflicting results

These results are remarkable to the extent that they seem to contradict the higher extraversion and lower neuroticism scale values among BCA patients as compared with patient controls, which were determined by Kissen and Eysenck¹¹ with the aid of the MPI.²⁰ In this respect, these results also contradict many other retrospective and prospective studies conducted on a larger scale by Eysenck.^{4,24,25} A possible explanation for the contradictory nature of the results may be the fact that the patients in our study were conscious of the nature of their illness, whereas in the majority of the other studies the patients did not know their diagnosis. During the prospective studies, no carcinoma had been determined at the time of the personality diagnosis. It cannot definitely be said why this should have such differing results, but the possibility undoubtedly exists.

Assessing stress

In addition, the E and N scale of the EPQ are very different from the MPI. Whereas Kissen¹¹ regards the lower neuroticism values on the MPI, which he determined among carcinoma patients in comparison with patient controls as an indication of the repression of emotions, Eysenck²⁶ interprets these as characteristic of the lack of emotions in the EPQ. As a result of a more recent study of women suffering from breast carcinoma, Cooper²⁷ describes his carcinoma patients in comparison with

the control group in a total population of 2163 patients as being much more concerned 'about worrying events' in their lives. He describes them as less willing to show emotions in public or even in private, capable of greater self-control in their relationship to others, more retiring, less competitive and less aggressive. Interestingly enough, Cooper *et al.*'s study, like ours, shows a decline in the extent of differences between carcinoma patients and the control group with increasing age. By using and evaluating a questionnaire to measure the capacity for coping with stress,²⁸ Cooper *et al.*²⁷ were able to show as well a significant negative correlation between age and the number of ways of coping with stress. In this context, Cooper *et al.* point out that on the one hand the number of methods of coping with stress decreases with increasing age, and, on the other hand, the number of worrying events increases with increasing age. Cooper *et al.*²⁷ see these results supported by Irwin and Anisman,²⁹ who suggest that increasing psychosocial stress leads to the tendency to exceed the individual's capacity to cope with life. Enervating behavioural patterns triggered in case of an emergency or adverse life event reduce the effectiveness of the immunological system, and enable or even trigger the genesis of malignant tumours directly:

The poorer the range and number of coping skills used by an individual, and the less aggressive they are behaviourally in dealing with life, the greater the strain on the system leading to an increased risk to the immunological system.

This hypothesis is supported by the decrease in extraversion scale values in healthy and patient control groups with increasing age (Fig. 1) in our investigation. The agreement on this point with Cooper *et al.*'s results²⁷ can be evaluated as being more supportive of their hypothesis concerning increased psychosocial stress with increasing age as an important partial cause of carcinogenesis than of Eysenck's constitutional hypothesis.

Acute and chronic stress

In this context, the difference in the effects of acute and chronic stress seems important. In the present state of knowledge, acute stress seems to promote the growth of cancer cells. On the other hand, chronic stress seems to have the opposite effect. This led Eysenck²⁶ to assume an 'inoculation

effect', which was able to explain the apparently protective effect of neuroticism and fear of cancer which had been observed in many studies.²⁴

Ageing, in fact, reduces the effectiveness of man's immunological system. Whether this effect is due to additional stress cannot be stated definitely at the present time. If this additional stress was to be regarded not as part of chronic stress, then it could be seen to have a *protective* effect against cancer rather than a *causal* effect. It must be emphasized that Eysenck's personality questionnaire has in fact led to differentiating between bronchial carcinoma patients and healthy patient control groups on extraversion and neuroticism, which show up in significantly different regression lines of age relevancy for the extraversion scale value as well as the neuroticism scale value (Figs. 1 and 2). Thus, the EPQ has shown itself to be promising in differentiating younger cancer patients and healthy patient control groups as compared with the much-used MMPI, which was developed for extreme groups (eg Shekelle *et al.*³⁰), or compared with MPI (eg Herms *et al.*³¹) or with FPI,³² as well as the questionnaire developed by Bahnson and Bahnson² which was used in the pilot study. In addition, it offers results which seem to be meaningful in the controversy concerning the value of the constitutional hypothesis compared with the hypothesis concerning psychosocial stress as partial cause for malignant tumours.

On the basis of the results here, it seems to be of interest for a future cooperative investigation to integrate the EPQ with the life events and coping strategy instrument developed by Cooper *et al.*²⁷

CONCLUSION

As a result of the discriminatory capacity of the E scale of the EPQ, the possibility was suggested of examining 40-50-year-olds and younger men in a prospective examination concerning their extraversion predisposition. In a follow-up study, the hypothesis would have to be tested whether young men with very high extraversion scores in fact show the risk of contracting bronchial carcinoma in the course of their lives to a markedly lesser degree. In addition, it could be supplemented by other psychosocial measures to see the combined strength of personality (as measured by the EPQ) and other notable predictors (ie life events, coping strategies, social support, etc.).³³

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