tion. The incidence of pelvic recurrence after palliative excision operations was 25%.

After radical anterior resection about 7% of patients developed pelvic recurrence and 10% after similar operations of a palliative nature.

The incidence of pelvic recurrence after radical excision operations for tumours of the lower third of the rectum is 14.5%, for middle-third tumours 8.3%, and for upper-third tumours 5.2%.

The particular liability of low rectal cancers to pelvic recurrence is explained by anatomical considerations which make adequate local excision difficult once growth has spread into the perirectal tissues.

Among other factors specially influencing the development of pelvic recurrence after restorative or non-restorative operations, whether radical or palliative, are tumours with lymphatic metastases, extensive local spread, and carcinomas of high-grade malignancy.

It would appear from this study that little more can be done to prevent pelvic recurrence by conventional surgical methods alone. It is suggested that radiotherapy be given a trial as an adjuvant method of treatment.

We wish to acknowledge the foresight of Mr. W. B. Gabriel, who founded the follow-up department at St. Mark's Hospital, without which this investigation would have been impossible. Our thanks are also due to the surgical staff of the hospital, Dr. I. G. Williams, and Dr. A. M. Jelliffe, for their help and advice in the preparation of this paper. Expenses were provided out of a block grant to the Research Department of St. Mark's from the British Empire Cancer Campaign.

REFERENCES

- Boreham, P. (1958). *Brit. J. Surg.*, **46**, 103.
 Bussey, H. J. R., Dukes, C. E., and Lockhart-Mummery, H. E. (1960). *Cancer of the Rectum*, edited by C. E. Dukes, chapter 23. Livingstone, Edinburgh and London.
 — and Morson, B. C. (1963). To be published.
 Deddish, M. R., and Stearns, M. W., jun. (1961). *Ann. Surg.*, **154**, 961.
 Dukes, C. E. (1932). *J. Path. Bact.*, **35**, 323.
 — and Bussey, H. J. R. (1958). *Brit. J. Cancer*, **12**, 309.
 Gilchrist, R. K., and David, V. C. (1948). *Surg. Gynec. Obstet.*, **86**, 359.
 Goligher, J. C., Dukes, C. E., and Bussey, H. J. R. (1951). *Brit. J. Surg.*, **39**, 199.
 Keynes, W. M. (1961). *Ann. Surg.*, **153**, 357.
 Leaming, R. H., Stearns, M. W., and Deddish, M. R. (1961). *Radio-logy*, **77**, 257.
 Lloyd-Davies, O. V. (1948). *Proc. roy. Soc. Med.*, **41**, 822.
 Morgan, C. N., and Lloyd-Davies, O. V. (1950). *Ibid.*, **43**, 706.
 Williams, I. G., and Horwitz, H. (1956). *Amer. J. Roentgenol.*, **76**, 919.

CANCER AND EXTRAVERSION

BY

ALEC COPPEN, M.D., D.P.M.

MARYSE METCALFE, Dip.Psych.App.

Medical Research Council, Neuropsychiatric Research Unit, Carshalton, Surrey

This investigation was prompted by a report which suggested that women who develop cancer are characterized by certain personality traits (Hagnell, 1961). The report was based on the results of an epidemiological survey of the 2,550 inhabitants of two adjacent rural parishes in the south of Sweden: this survey, which was started in 1947, included an interview during which a personality assessment was made on each subject. Ten years later the procedure was repeated and the subjects' subsequent medical history was examined. During the follow-up it was found that a significantly high proportion of women who had developed cancer had been originally rated as *substable*. The rating was based on the Swedish system of personality assessment described by Sjöbring which has been used extensively in Sweden but is not well known in this country (for an account in English see Nyman, 1956). Sjöbring described four personality factors which he called *capacity*, *validity*, *stability*, and *solidity*: these are held to vary continuously and independently of each other in the general population. Deviation above and below the mean for each factor is referred to as either the "super" or the "sub" form. As we are concerned solely with the sub form of *stability* in this investigation, no further mention is made of these other factors. The *substable* personality is described as warm, concrete, naive, industrious, sociable, and tending towards personal relationships (Nyman, 1956). *Substability* in Sjöbring's system has traits in common with Cattell's (1950) "factor A" and Eysenck's (1959) "extraversion." With regard to the present investigation, it is of importance to note that Swedish investigators have found that *substability* is correlated with factors in body build and also with urinary excretion rates of certain steroids (Lindgård and Nyman, 1956).

We proposed, in the present investigation, to test the hypothesis that a group of women who developed cancer would obtain higher extraversion scores on a personality

questionary than would control groups of women without cancer.

Method

The questionnaire used in the investigation was the Maudsley personality inventory (M.P.I.). This questionnaire yields two scores: one for neuroticism and one for extraversion. Extraversion, according to Eysenck (1959), refers to the outgoing, uninhibited social proclivities of a person. The M.P.I. has been used in many investigations in this country, and it has been shown to have a satisfactory reliability and validity (Eysenck, 1959, 1962). The questionnaire consists of a printed form of 48 questions—24 to measure neuroticism and 24 for extraversion. The patient responds by circling a "Yes," "No," or "?."

The investigation was carried out in a general hospital. The subjects were patients in two gynaecological and two surgical wards or were out-patients attending the surgical clinic. The sister or medical secretary handed patients the questionnaire and asked them if they would co-operate in a clinical investigation. No patient refused to co-operate. At the end of the investigation the questionnaires were collected and scored and the diagnosis of each patient was obtained. Of the 47 patients with a malignant tumour, 32 had cancer of the breast, 4 had cancer of the uterus, and 11 had cancer in other parts of the body.

Two control groups were used. A hospital control group consisted of 129 patients with various gynaecological and surgical conditions in whom there was definitely no evidence of tumour and who fell in the same age-group as the patients with cancer. Matching for age is important, since it has been found that extraversion scores decline significantly with age (Eysenck, 1959; Coppen and Kessel, 1963). A second control group of 31 subjects was obtained from a representative sample of the general population of the London area (Coppen and Kessel, 1963). This control

group was somewhat younger than the hospital groups, and therefore these subjects would be expected to have had higher extraversion scores than the cancer group on account of their age alone. The mean extraversion scores for in-patients and out-patients were very similar for each group, and they were not considered separately.

Results

The results for the whole group are shown in Table I. The mean ages of the cancer group and of the hospital controls were very similar. The mean extraversion scores of the hospital controls and the general population controls were also very similar. The mean extraversion score of

TABLE I.—Age and M.P.I. Scores of Patients and Controls

	No.	Age		Neuroticism Score		Extraversion Score	
		Mean	S.D.	Mean	S.D.	Mean	S.D.
Patients with cancer	47	51.4	9.7	23.53	11.01	25.38	9.64
Hospital controls	63	51.7	8.1	25.79	10.59	21.11	8.82
General population controls	31	45.6	3.4	23.65	11.9	21.32	9.16
All controls	94	49.8	7.8	25.08	11.01	21.18	8.89

Extraversion score:

Cancer patients	versus	hospital controls	..	..	..	P<0.01
"	"	general population controls	..	..	..	P<0.02
"	"	all controls	..	..	..	P<0.005

the cancer group was compared with that of the hospital control group, the general population control group, and the combined control group by means of a one-tail t-test. The cancer group had significantly higher extraversion scores than both control groups. The mean scores for neuroticism did not differ significantly.

Table II shows that when the subgroups of cancer patients are compared the means of their extraversion scores are very similar. A t-test shows that there is no significant difference between the scores of the two larger

TABLE II.—Mean Extraversion Scores for Subgroups Within the Cancer Group

Cancer Subgroup	No.	Extraversion Score	
		Mean	S.D.
Breast cancer	32	25.71	8.38
Cancer of uterus	4	22.70	11.25
Non-genital cancer	11	25.36	7.39

Extraversion score:

Breast cancer	versus	all controls	..	..	..	P=0.001.
Non-genital cancer	versus	all controls	..	..	..	P between 0.05 and 0.1.

subgroups (breast cancer and non-genital cancer). The breast-cancer group shows a definitely higher mean extraversion score than the control groups. The non-genital cancer group, when compared with the control groups, also shows a higher mean extraversion score, but this finding is only significant at a level of probability between 0.5 and 0.1.

It seems reasonable, therefore, pending an investigation on a larger group of non-genital cancer patients, to limit the validity of our finding of a higher extraversion score to breast-cancer patients, and to indicate only the possibility of a similar trend in the case of a general group of women with cancer.

Discussion

It seems unlikely that the observed differences in extraversion are a result of the illness or the stay in hospital of these patients, since the hospital control group of patients were placed in very similar circumstances to the cancer group, and often had very similar symptoms—for example, a lump in the breast. The neuroticism scores of the two

groups were not significantly different, and it seems probable that this score would be at least as likely to be affected by the illness as the extraversion score.

The present observations, based on a comparison of groups matched for age and circumstances at the time of the test, confirm and extend the results obtained by Hagnell (1961), who had tested his patients several years before the onset of their illness. We feel that our results, taken together with those of Hagnell, indicate that women who develop breast cancer do have significantly high extraversion scores, and that this is a constitutionally determined characteristic of these patients rather than a temporary reaction to their illness.

As we have indicated above, there is some evidence that this personality trait may be associated with endocrinological factors and with body build. Lindegård and Nyman (1956), who investigated the interrelations between body build and psychological and endocrinological factors in 287 normal males in Sweden, found that substability was correlated with muscularity and with body fat; it was also correlated with the excretion rate of urinary 17-hydroxycorticoids. This latter association was not dependent on the correlations that were also found to exist between body build and steroid excretion rates.

These correlations are of relevance in view of evidence accumulating from other sources of a relatively high incidence of malignant tumours in patients showing signs of increased adrenocorticoid activity (Allott and Skelton, 1960; B.M.J., 1962). Although the nature of this association is by no means clear, one perhaps may speculate that certain constitutional factors predispose individuals to develop malignant tumours. Extraversion may be one manifestation of this constitutional difference, which may also be related to physique and to hormonal activity.

Summary

Extraversion was measured by means of a personality questionnaire in 47 women who had developed cancer. The extraversion score was found to be higher in this group than in control groups drawn both from the same hospital and from the general population. This personality difference was highly significant in the case of breast cancer, but less significant in the case of non-genital cancer. We regard this difference as a manifestation of a constitutional deviation characterizing those women who had developed breast cancer.

We should like to thank Miss Daly, Miss Wilson, Mr. York-Mason, and Mr. Kidd for permission to test their patients. We also wish to thank the sisters, the medical secretaries, and the senior records clerk at St. Helier Hospital for their helpful co-operation in carrying out this investigation.

REFERENCES

- Allott, E. N., and Skelton, M. O. (1960). *Lancet*, 2, 278.
- Brit. med. J., 1960, 2, 505.
- Cattell, R. B. (1950). *Personality*. New York.
- Coppen, A. J., and Kessell, N. (1963). In preparation.
- Eysenck, H. J. (1959). *The Manual of the Maudsley Personality Inventory*. University of London Press.
- Eysenck, S. B. G. (1962). *Life Sci.*, 1, 13.
- Hagnell, O. (1961). *Svenska Läk.-Tidn.*, 58, 492.
- Lindegård, B., and Nyman, G. E. (1956). *Interrelations between Psychologic, Somatologic, and Endocrine Dimensions*. Lunds Universitets Arsskrift, Lund.
- Nyman, G. E. (1956). *Variations in Personality*. Lunds Universitets Arsskrift, Lund.

The Lawson Tait Memorial Trust has made an award of £400 to a group at Manchester Children's Hospital that is investigating the cause and possible prevention of mental retardation in children.