# PERSONALITY TRAITS AND THE NORMAL ELECTRO-ENCEPHALOGRAM

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## INTRODUCTION

CORRELATIONS have been noted between certain persistent personality traits on the one hand and certain patterns within the normal range of variation of the EEG on the other. Some of these correlations had been based on impressionistic assessments of personality, and the following paper contains the results of part of an investigation which was undertaken in order to check these assessments by a more objective method, and to define more precisely some of the qualities reported.

## CASE MATERIAL

Forty male chronic alcoholics were studied. For this paper, an alcoholic was one who sought treatment admitting that he was no longer able to control his consumption of alcohol despite a desire to do so. Those in whom there was any suspicion of a concomitant psychosis or of permanent organic disorder were excluded from the series. Some patients were accepted in whom minor signs of organic disorder, such as tremor and slurred speech were present at the first interview, but absent at the second interview and subsequently. If they had not disappeared the case was dropped from the series. The alcoholic group was selected as being the largest group of patients available in this hospital in whom a high degree of accessibility and co-operation in testing might be expected.

The patients were examined ten days from the day of admission, this period being chosen because preliminary observations seemed to show that a significant degree of intellectual blunting which was present on admission had almost invariably cleared up ten days later.

## METHOD

(a) *EEG Examination:* This was a standard procedure and has been described previously (McAdam and McClatchey, 1952). A refinement was that a band-pass filter (Dawe and Morris, 1952) was used to obtain a more accurate measurement of alpha activity than can be derived from visual analysis. Microvoltage, distribution and frequency were estimated in respect of the three most conspicuous wave-bands—theta (4 to 7 cps.), alpha (8 to 13 cps.), and beta (14 to 30 cps). Delta activity was not apparent in this series and activity at frequencies above 30 cps. could not be handled by visual analysis and was in any event very inconspicuous. In the case of the alpha rhythm, the filter referred to above facilitated the measurement of the alpha index, which expresses



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as a percentage the duration of time in which alpha activity is apparent; thus an alpha index of 100 would indicate continuous alpha activity, while an index of zero would indicate that alpha activity could not be detected at all. A comparable assessment was made in respect of other frequencies, but lacking non-visual methods the amount of activity could only be estimated and described as nil, trace, slight, moderate and high.

(b) *Psychological Assessment:* A Standard Psychological Interview was given to each patient in order to obtain a subjective qualitative assessment—which was, at the same time, capable of quantitative comparison. This technique consists of holding a conversation with the patient which is led over standard series of topics. These include for example: Interests, Relations to others, Attitude to past and future and Attitude to illness. Care is taken not to allow this interview to become merely a standard questionnaire. The patient is encouraged to elaborate his ideas, the only restriction being to keep the conversation within the topic under discussion. Everything the patient says is taken down verbatim as far as possible. Apart from the initial question, such as "What are you interested in?", or, "How do you get on with others?", the patient is simply encouraged by such remarks as "Yes?", "When?", "What next?", and so on. At the same time notes are taken about the patient's manner, speech and movements. The data from these interview notes are brought together to form a coherent personality description of each patient. These descriptions are then divided on to cards, each card containing a separate statement about or by the patient. These are then assessed by the method of Comparative Matching (Raven, 1948).

In addition to the Interview the Ranking Rorschach test was given (Eysenck, 1947). Here, each person has to place nine given responses to each card in his order of preference. Five of each nine responses are said to be normal and four "neurotic". The completely normal person would rank the four "neurotic" responses 6th, 7th, 8th and 9th; the completely "neurotic" would rank them 1st, 2nd, 3rd and 4th. The summed ranks of the four "neurotic" answers for each of the ten cards is the person's score. A completely normal person would have a score of $9+8+7+6=30$ for each card and a completely "neurotic" person would score $1+2+3+4=10$. On ten cards the normal person then has a score of 30 times $10=300$ and the "neurotic" person a score of 10 times $10=100$. All possible scores lie between these limits. Eysenck found the test to discriminate significantly between groups despite a great overlapping of individual scores.

(c) *Psychological Assessment and EEG Results.* To facilitate handling of the material, a dichotomy was made into cases with a low alpha index (from 0 to 50) and those with a high alpha index (51 to 100), in order to demonstrate whether or not there was any significant matching or contrasting of personality traits in the two groups. For the same purpose a second dichotomy was made between a low and a high index of high frequency (beta) activity; and a third between a very low (trace and slight) and a moderate amount of low frequency (theta) activity.

In twenty-nine cases EEG examinations were carried out at a later date and a fourth dichotomy was made between those cases whose alpha index remained constant and those in whom it had changed.

A product–moment correlation coefficient was obtained between the alpha index and the ranking Rorschach score.

*Electro-encephalograph: Results.* The EEG showed a curve of normal distribution in respect of the frequency, index and microvoltage. A correlation of $-0{\cdot}330$ was found between alpha frequency and alpha index ($P.>0{\cdot}05<0{\cdot}01$)

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indicating a tendency for a low alpha frequency to go with a high alpha index and for a high alpha frequency to go with a low alpha index.

In eleven of the twelve cases where there was a change in the alpha index on subsequent testing, the change was from a low to a high index.

## RESULTS

### *Personality Assessments*

Table I shows the number of times each personality trait was noted, first, in the group of alcoholics as a whole, and then in each of the four EEG dichotomies.

*The Alcoholic Group as a whole:* A trait was said to be common in the group as a whole when occurring in at least ten patients (i.e. 25 per cent. N).

TABLE I

*Analysis of Personality descriptions obtained from the Standard Interview*

| | Alcoholic Group | Theta Index | | Alpha Index | | Alpha Index on Retest | | Beta Index | |
|---|---|---|---|---|---|---|---|---|---|
| | | Normal | Excess | Low | High | Constant | Change | Low | High |
| It was said of the Patient that: N= | 40 | 29 | 10 | 20 | 19 | 17 | 12 | 13 | 26 |
| ***In appearance*** | | | | | | | | | |
| 1. He was of medium height and build | 10 | 8 | 1 | 6 | 3 | 2 | 5 | 3 | 6 |
| 2. He was of medium height and stout build | 7 | 5 | 2 | 3 | 4 | 3 | 3 | 3 | 4 |
| 3. He was tall and of average build | 6 | 4 | 2 | 3 | 3 | 6 | 0 | 2 | 4 |
| 4. He was tall and thin | 3 | 2 | 1 | 0 | 3 | 2 | 1 | 2 | 1 |
| 5. He was short and of average build | 4 | 4 | 0 | 2 | 2 | 1 | 1 | 1 | 3 |
| 6. He was short and stout | 7 | 5 | 2 | 5 | 2 | 2 | 2 | 1 | 6 |
| 7. He was short and thin | 3 | 1 | 2 | 1 | 2 | 2 | 0 | 1 | 2 |
| ***Apart from height and build—in appearance*** | | | | | | | | | |
| 1. He appeared younger or older than his age indicated | 7 | 6 | 1 | 5 | 2 | 3 | 3 | 1 | 6 |
| 2. He had unusual behavioural characteristics | 14 | 7 | 6 | 6 | 7 | 3 | 5 | 3 | 10 |
| 3. He tried to impress | 3 | 2 | 1 | 2 | 1 | 1 | 2 | 1 | 2 |
| ***In attitude*** | | | | | | | | | |
| 1. He was co-operative | 23 | 16 | 7 | 13 | 10 | 3 | 3 | 7 | 16 |
| 2. He wanted to talk about himself and his problems | 6 | 5 | 1 | 5 | 1 | 0 | 3 | 2 | 4 |
| 3. He wanted to talk about the investigation rather than himself and was only superficially co-operative | 9 | 7 | 2 | 2 | 7 | 1 | 0 | 3 | 6 |
| ***In manner*** | | | | | | | | | |
| 1. He was calm and at ease | 14 | 10 | 4 | 7 | 7 | 6 | 5 | 5 | 9 |
| 2. He appeared to show some nervousness in being tense or trying to impress but relaxed as the interview proceeded | 10 | 8 | 2 | 7 | 3 | 3 | 4 | 3 | 7 |
| 3. He was definitely nervous and ill at ease | 13 | 11 | 1 | 6 | 6 | 5 | 4 | 4 | 8 |
| ***In conversation*** | | | | | | | | | |
| 1. His speech was coherent | 40 | 29 | 10 | 20 | 19 | 17 | 12 | 14 | 25 |
| 2. His speech was fluent | 34 | 25 | 8 | 17 | 16 | 15 | 11 | 12 | 21 |
| 3. His speech was not fluent | 6 | 4 | 2 | 3 | 3 | 2 | 1 | 1 | 5 |
| 4. He was talkative | 17 | 13 | 3 | 7 | 10 | 9 | 3 | 7 | 10 |
| 5. He was talkative about himself | 3 | 3 | 0 | 3 | 0 | 1 | 2 | 0 | 3 |
| 6. He was talkative about mental abnormality | 2 | 1 | 1 | 2 | 0 | 0 | 1 | 0 | 2 |
| 7. He became talkative as the interview proceeded | 2 | 2 | 0 | 2 | 0 | 0 | 2 | 0 | 2 |
| 8. He was not talkative | 6 | 2 | 3 | 2 | 3 | 3 | 1 | 1 | 4 |
| ***Of his interests*** | | | | | | | | | |
| 1. His interests were limited due to his work or due to his drinking | 12 | 11 | 1 | 8 | 4 | 5 | 4 | 4 | 8 |
| 2. He claimed he had interests but these were of a conventional nature | 10 | 7 | 3 | 7 | 3 | 3 | 3 | 3 | 7 |
| 3. His main interest was in his work | 9 | 5 | 4 | 3 | 6 | 3 | 3 | 3 | 6 |
| 4. He had an unusual hobby requiring effort | 7 | 5 | 1 | 0 | 6 | 4 | 0 | 3 | 3 |
| 5. Although conventional his interests had some unusual features | 2 | 1 | 1 | 2 | 0 | 1 | 1 | 0 | 2 |

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| Patient said: | Alcoholic Group | Theta Index | | Alpha Index | | Alpha Index on Retest | | Beta Index | |
|---|---|---|---|---|---|---|---|---|---|
| | | Normal | Excess | Low | High | Constant | Change | Low | High |
| N= | 40 | 29 | 10 | 20 | 19 | 17 | 12 | 13 | 26 |
| *Of his occupation* | | | | | | | | | |
| 1. He owned his own business and dealt with people | 18 | 13 | 5 | 12 | 6 | 7 | 6 | 3 | 15 |
| 2. He worked for someone else and was concerned with routine work | 8 | 6 | 2 | 2 | 6 | 4 | 2 | 5 | 3 |
| 3. He was a doctor | 6 | 5 | 1 | 2 | 4 | 3 | 3 | 5 | 1 |
| 4. He had no settled occupation | 2 | 2 | 0 | 1 | 1 | 1 | 1 | 0 | 2 |
| *Of the time he had been in his present occupation* | | | | | | | | | |
| 1. It was a family business and he had always been in it | 8 | 4 | 4 | 2 | 6 | 6 | 1 | 5 | 3 |
| 2. It was not a family business but he had always been in it | 7 | 6 | 1 | 4 | 3 | 3 | 3 | 2 | 5 |
| 3. He had not always been in his present occupation | 4 | 4 | 0 | 3 | 1 | 2 | 1 | 1 | 3 |
| *Of his attitude to his occupation* | | | | | | | | | |
| 1. He expressed definite liking for his work | 8 | 7 | 1 | 5 | 3 | 3 | 4 | 2 | 6 |
| 2. He wasn't altogether satisfied or expressed dislike | 7 | 4 | 3 | 1 | 6 | 6 | 1 | 6 | 1 |
| 3. He didn't express any definite opinion | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| *Of his relation with others* | | | | | | | | | |
| 1. He claimed he got on very well with others | 9 | 7 | 2 | 6 | 3 | 2 | 6 | 2 | 7 |
| 2. He claimed he got on very well with others but contradicted himself | 10 | 8 | 1 | 7 | 2 | 4 | 2 | 2 | 7 |
| 3. He was about average in getting on with others | 11 | 6 | 5 | 3 | 8 | 7 | 1 | 4 | 7 |
| 4. Being shy interfered with his relations to others | 8 | 7 | 1 | 3 | 5 | 3 | 2 | 5 | 3 |
| *Of his attitude to being alone or being with others* | | | | | | | | | |
| 1. He preferred being alone | 10 | 8 | 2 | 2 | 8 | 6 | 2 | 6 | 4 |
| 2. He did not mind being alone or with others | 13 | 9 | 4 | 7 | 6 | 7 | 4 | 5 | 8 |
| 3. He didn't like being alone | 8 | 5 | 2 | 6 | 1 | 4 | 1 | 0 | 7 |
| *His attitude to his past life* | | | | | | | | | |
| 1. He claimed he had had a happy life—despite various circumstances | 13 | 10 | 3 | 5 | 8 | 6 | 5 | 4 | 9 |
| 2. He admitted to periods of happiness and unhappiness | 5 | 2 | 3 | 1 | 4 | 3 | 0 | 4 | 1 |
| 3. He had not been happy | 9 | 8 | 1 | 5 | 4 | 4 | 4 | 4 | 5 |
| 4. He tended to evade the point and suggested a general attitude of discontent | 13 | 9 | 3 | 9 | 3 | 4 | 3 | 1 | 11 |
| *Of the causes of his alcoholism* | | | | | | | | | |
| 1. He tended to blame someone else—usually his wife, for his drinking | 11 | 10 | 1 | 9 | 2 | 4 | 5 | 3 | 8 |
| 2. His drinking was just habit or arose from boredom | 15 | 11 | 3 | 6 | 8 | 4 | 6 | 4 | 10 |
| 3. His drinking developed because of worry | 13 | 8 | 5 | 4 | 9 | 9 | 1 | 6 | 7 |
| 4. He denied that he was alcoholic | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 |
| *Of his attitude to his alcoholism* | | | | | | | | | |
| 1. He was going to stop drinking altogether | 19 | 16 | 3 | 10 | 9 | 6 | 6 | 5 | 14 |
| 2. He wanted to stop but wasn't confident of his ability to do so | 4 | 3 | 1 | 3 | 1 | 2 | 1 | 2 | 2 |
| 3. He did not want to give up drinking entirely | 7 | 3 | 4 | 2 | 5 | 5 | 3 | 4 | 3 |
| 4. He was undecided | 5 | 4 | 1 | 4 | 1 | 1 | 3 | 0 | 5 |
| *Of his memory and concentration* | | | | | | | | | |
| 1. There was no impairment in his abilities | 17 | 11 | 6 | 10 | 7 | 9 | 4 | 5 | 12 |
| 2. His memory and concentration had suffered | 23 | 18 | 4 | 10 | 12 | 8 | 8 | 8 | 14 |
| *Of his feelings at present* | | | | | | | | | |
| 1. He felt quite happy | 14 | 9 | 5 | 5 | 9 | 4 | 4 | 3 | 11 |
| 2. He felt more contented but not very confident about the future | 10 | 6 | 4 | 4 | 6 | 7 | 1 | 6 | 4 |
| 3. He felt depressed over his illness | 14 | 13 | 0 | 9 | 4 | 5 | 6 | 4 | 9 |
| *Of his fears and worries* | | | | | | | | | |
| 1. He had no fears or worries | 11 | 9 | 2 | 9 | 2 | 4 | 4 | 1 | 10 |
| 2. He was a little apprehensive | 9 | 6 | 3 | 5 | 4 | 3 | 4 | 4 | 5 |
| 3. He had a definite fear which troubled him | 13 | 9 | 4 | 4 | 9 | 8 | 3 | 7 | 6 |
| *Of his determination and will power* | | | | | | | | | |
| 1. He was strong-willed | 14 | 12 | 2 | 9 | 5 | 4 | 6 | 4 | 10 |
| 2. He was generally strong-willed but with exceptions—mostly alcohol | 8 | 5 | 3 | 5 | 3 | 5 | 3 | 3 | 5 |
| 3. He was about average in will power | 5 | 3 | 2 | 3 | 2 | 3 | 1 | 1 | 4 |
| 4. His will power was variable—being strong in some respects but not in others | 6 | 5 | 1 | 1 | 5 | 3 | 2 | 4 | 2 |
| 5. He was not strong-willed | 5 | 3 | 2 | 1 | 4 | 2 | 0 | 1 | 4 |

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In the Table each of these common traits when collected together gives the traits common to the whole group of alcoholics studied. From the Table it is immediately evident that, apart from the direct effects of alcohol such as tremors and memory impairment, the forty alcoholics studied do not present as a single group any typical personality. The traits found, and their frequencies, can only be summarized satisfactorily as follows:

*It was noted of the patient* that he was of medium height and build (10). He had unusual behavioural characteristics apparently resulting from his alcoholism, such as appearing rather bemused, or possessing hand tremors (14). In attitude he is co-operative; but in manner he may be calm and at ease (13), although he may show some nervousness in being at first tense or trying to impress, but relaxing as the interview proceeds (10). In conversation he is coherent (40), fluent (34), and even talkative (17).

*He says of himself* that his interests are limited, due to his work, or because of his drinking (12), while the few interests he claims are of a conventional nature (10), such as playing golf, rather than those requiring independent effort. He often owns his own business, where in an executive position he has to deal mainly with staff and clients (18). He says he is about average in getting on with others (11); alternatively, if he claims he gets on very well with people he will contradict himself (10). He says he does not mind if he is alone, or in company (13), and may even prefer being alone (10).

*Concerning his past and future*, he claims to have been happy in the past—despite various circumstances such as drinking and marital difficulties (13), although he may convey a vague general attitude of discontent and evade this topic (13). He says that apart from going back to his work and looking after his family, he has no plans for the future, although sometimes he says he is ambitious and wants a change (12).

*His alcoholism* he may explain in one of three ways: he may blame the behaviour of someone else, usually his wife's infidelity (11): he may deny any real cause and attribute it to habit or boredom (15); or he may blame his own worry—often over getting behind in his work (13). He frequently says he has suffered impairment in his concentration and memory—usually for recent events and names (23), although often he denies any such impairment due to alcoholism. He now says he feels quite well (14), or more contented but not very confident about the future (10); quite as often he says he feels depressed over his alcoholism (14). He may admit to particular fears and worries (13), but also he denies this (11). He regards himself as being strong-willed and determined (14), and maintains that from now onwards he is going to abstain completely from drinking (19).

From this summary of the Table, the one inference which can be made is that as a single class, the forty alcoholics studied show great differences, even contradictions, of personality traits rather than any common characteristics. Even when we extract the few statements which apply to approximately half the group as a whole, we find contradictions persist. In conversation they are coherent (40) and fluent (34), yet say that their memory and powers of concentration are impaired (23). They have their own business (18), but say that apart from going back to their work they have no plans (20). They maintain that in future they are going to abstain completely from drinking (19), but this has still to be put into action. In short, this comparative study of the Table immediately confirms the opinions collected by Sutherland, Schroeder and Tordella (1950) in their review of the literature, that the only thing alcoholics have in common is their drinking and its results.

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*Comparisons of personality traits with EEG dichotomies.* A trait was said to be typical of one side of any dichotomy relative to the other side when the frequency of the trait was both (*a*) at least 25 per cent. of the total on that side of the dichotomy, and (*b*) occurred on this side with twice the frequency with which it occurred on the other side of the same dichotomy, allowing for inequalities in distribution. In the Table, traits satisfying these two criteria are underlined.

Inspection of the typical statements shown in the Table suggested that certain traits were typical of more than one EEG dichotomy. Statements typical of a low alpha index tend to be also typical of a high index of high frequency activity, of a change in alpha index, and of a low index of low frequency activity. Conversely, statements typical of a high alpha index tend to be also typical of a low index of high frequency activity, of a constancy of alpha index, and of a moderate amount of low frequency activity. It follows that the EEG dichotomies are themselves intercorrelated with respect to psychological traits noted as typical of them.

Referring to the low and high alpha index dichotomy, as it contained the overall largest number of typical statements, and taking each remaining EEG dichotomy one at a time, the chi-squared tables obtained showed the following results. It could be seen at once that statements typical of any given EEG dichotomy always occurred *on one and only on one* side of the alpha index dichotomy. For example, seven of the nine statements typical of a low index of high frequency activity are also typical of a high alpha index, but none of a low alpha index; whereas, by chance, the distribution would be approximately equal. The observed correlations could only occur by chance once in twenty cases.

Intercorrelations between typical psychological traits show in effect that we have a tendency towards an overall EEG dichotomy. We have Group A in which is found a predominance of high frequency activity (i.e. a high index of high frequency activity, a low alpha index, tendency for the alpha index to change, and very little sign of low frequency activity) contrasting with Group B in which is found a predominance of alpha activity (i.e. a low index of high frequency activity, a high alpha index which is constant in repeated records, and a relatively larger amount of low frequency activity). When the statements typical of these two groups are collected together it will be seen that they present consistent but contrasting personality types:

*Group A.* The person whose EEG contains a predominance of high frequency activity is typically of medium height and build, or short and stout. He appears younger or older than his actual age. In attitude, he is co-operative in that he wants to talk about himself and his problems and treats the interview as an opportunity for this. In manner he shows nervousness, being definitely ill at ease, tense, or trying to impress, relaxing perhaps as the interview proceeds. He complains that his interests have been limited by his work or his drinking, while his interests are of a conventional nature such as playing golf or motoring. He owns his own business, he deals with people rather than things, and expresses a definite liking for his work. Concerning his relations with others, although he claims invariably that he gets on well with people, this is contradicted by some added observation, while he admits that shyness interferes with his social relationships. On the other hand he doesn't like being alone. He says his past life has not been happy and he may evade the point—suggesting a general attitude of discontent to the past. For the future, he is ambitious—wanting to make a success of his career and will change his work if necessary. With regard

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to the causes of his alcoholism, he blames someone else—usually his wife and her infidelity, or else he denies a real cause and attributes it to habit or boredom. His present attitude to his drinking may be undecided, but when decided it is to abstain completely. He feels depressed over his drinking and how it has affected his life, but claims he has no particular fears or worries. He says he is strong-willed and determined.

*Group B.* The person whose EEG contains a predominance of alpha activity is typically tall and of medium build, with unusual behavioural characteristics apparently resulting from his alcoholism such as appearing rather bemused or possessing hand tremors. In attitude he is only superficially co-operative, and although talkative, he talks about the investigation rather than himself. He says his interests lie in his work, but he often has some unusual hobby such as painting or playing a musical instrument. He usually works for someone else in a more routine kind of occupation—clerking or engineering; if he does own his own business it is usually a family one he has inherited, not one he has achieved by his own exertions. He expresses dislike for his work, or at the best mentions certain unsatisfactory features in what he is doing at present. He says he is about average in getting on with people, and the point does not seem to be important to him, as he prefers being alone to being with others. In regard to his past life he admits to periods of happiness and unhappiness rather than encompassing the whole in a general attitude. He has no plans for the future. Excessive drinking arose in his case, he says, because of worry —often over getting behind in his work, and now he wants to give up drinking altogether. At present, he feels more contented, but he isn't very confident about the future. He has a definite fear which troubles him, which may be a fear of heights, or fires, or a less common one such as a fear of moths. He thinks his will power is variable—strong in some things and not in others.

Groups A and B therefore show a tendency to be differentiated on a wide range of personality traits. In fact the only thing they appear to have in common are fluency of speech, together with impairment of memory and concentration.

It may be objected that the differences between the two groups could be due to the amount of alcohol consumed or to the duration of the addiction. No correlation between these two factors and the grouping was found. Also, age of the patient and results of intelligence tests (Progressive Matrices and Mill Hill Vocabulary test) were not significantly different between the two groups.

*Ranking Rorschach.* The correlation coefficient obtained between alpha index and Rorschach scores was $=0{\cdot}411$. This figure could occur by chance less than one in a hundred times. It indicates that for the 40 alcoholics studied, the lower the person's alpha index, the more "neurotic", according to Eysenck, is his score on the Ranking Rorschach test.

## Discussion of Results

Saul *et al.* (1937, 1949) studied individuals in psychoanalysis and found a high alpha index to be characteristically associated with a passive, submissive, dependent, receptive attitude; avoidance of effort, responsibility and contact with other people; while a low alpha index was usually associated with a consistent, well-directed, freely indulged drive to activity. McAdam and McClatchey (1952) made similar observations in a group of aged psychotic patients when the EEG was sufficiently free from low frequency activity to avoid masking of the alpha and higher frequencies, and when there was no indication of dementia of the senile or arteriosclerotic type. From a different

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aspect, Mundy-Castle (1953) found that individuals with "primary functioning", (quick, impulsive, variable and highly stimulable) possessed relatively high alpha frequencies, while the "secondary functioning" were slow, cautious, steady and had relatively low alpha frequencies. The latter group seems to show affinities with the groups referred to above, in whom "passivity" was a feature and in which a high alpha index was characteristic, and the connection between the two types is also shown in the correlation we have noted between a low alpha frequency and a high alpha index.

The present study once more shows a tendency for a clustering of certain personality traits and EEG patterns. The dichotomy of activity-passivity is substantiated and appears to be correlated with the whole range of EEG activity, rather than of any one waveband. Further, this activity-passivity dichotomy would appear to express a more general dichotomy of personality which many workers have described from their different points of view. It includes that of extraversion-introversion (Jung, 1938) and cyclothymia-schizothymia (Kretschmer, 1925) to mention only two of the more well-known variations upon this theme. Despite differences and contradictions, there appears to be a fundamental dichotomy which can perhaps be best described as an opposition between a generally objective, active state in which awareness tends very often to be confined to or directed at certain aspects of the external world; and a generally subjective, passive state in which there is less direction, but awareness of a wider field, not necessarily confined to the external world.

The observed correlation between the Ranking Rorschach test and low alpha index indicates that the latter may have some relation with Eysenck's "neuroticism". Williams (1939) and others have shown that attention diminishes the amount of alpha activity. The comparative study of the information obtained from the standard interview in our material demonstrates that the individuals with low alpha indices were typically those for whom the chief interests were work and conventional hobbies such as golf and driving a car. Concentrated on work and conventional external pursuits, these patients seemed unable to relax, but on learning to do so, began to approach the class of patient who had a high alpha index and a typically wider range of interests.

This raises the question of the applicability of the concepts of "extraversion" and "cyclothymia" to our findings. Much more intensive work is needed on a small group of patients to clear up the problem of this relationship. There is, for example, at least a possibility that the "extraversion" of the chronic alcoholic is a neurotic simulation of healthy extraversion.

The present comparative study of forty selected alcoholics demonstrates the value of the technique employed for dealing with interview material.

## Summary and Conclusions

(1) Personality traits of a group of alcoholic patients were obtained from a Standard Interview and compared with EEG tracings.

(2) This group did not present any typical personality picture of the alcoholic but rather indicated that apart from their drinking and its effects alcoholics have little in common.

(3) A dichotomy of personality traits was obtained which appears to be related to the EEG tracing as a whole and not to any one frequency index.

(4) A grouping of qualities suggesting extraversion is apparently related to a predominance of high frequency activity in the EEG, and introversion to a predominance of alpha activity.

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