

The controlled observation of behaviour is perhaps the most fundamental part of the work. Each potential pilot (or prospective candidate for employment) is given at least three or four performance tests of specific skills. The candidate is unaware of the fact that while he is doing the test, the tester is not only administering and scoring the test, but as a result of careful observation of his behaviour, reactions and remarks, is making his assessments on the temperament blank provided. It is the policy to keep one tester on a particular test for some months so that he can formulate an adequate idea of the range of behaviour that will be encountered in the test situation and so will be able to make his assessments against this background. In other words, the observation of the behaviour characteristics is done in a standardised situation.

When the tester has completed his temperament assessment and filled in the other behaviour characteristics which may be of value to the interviewer, he uses the back of the sheet for his personality summary. This is a general review of the tester's impressions of the candidate and serves many useful purposes:

(1) It gives the tester an opportunity to remark on behaviour qualities which he has observed and which are not provided for on the blank.

(2) It enables the tester to qualify his ratings. For instance, a subject may initially have been very nervous, but have settled down well as the test progressed. Or again, a subject may initially have been very reserved but as he felt more at home in the situation become quite chatty. A rating scale does not allow for important distinctions of this sort, and these remarks do, to some extent, compensate for this defect.

(3) It allows the tester to draw attention to the excessive amount or unusual absence of a quality which can not be adequately expressed on a five point scale.

(4) It allows the tester to make general "gestalt remarks" such as "well adjusted", "well integrated" and the like, though he is

aware that he is concerned chiefly with observable behaviour and that he should not diverge so far from this criterion as to be indulging in flights of fancy or relying entirely on intuition.

Finally, the candidate completes a biographical inventory giving information concerning his family background, educational status, occupational history, and health record. He is then interviewed, and the interviewer has at his disposal the candidate's test scores, at least three independent assessments of his temperament, and the biographical information. The interviewer is then relatively sure about some of the candidate's behaviour characteristics. The testers' remarks and biographical information should afford useful clues as to the lines along which the interview should be directed. It is the interviewer who gives the final assessment for temperament and personality.

The reliability and validity of these ratings has been investigated and in order to give a complete description of the application of this scheme, some of these results are summarised here. One coefficient of reliability was obtained by correlating the individual Function, Activity, and Emotionality ratings made by a particular tester for a certain candidate with the "pool" or combined ratings of Function, Activity and Emotionality respectively, made by three other testers for that candidate. This was done for five different testers, and the correlation coefficients, together with the number of cases are given below.¹

Table III.

Tester	Function	Activity	Emotionality	No. of Cases
I	.37	.39	.30	306
II	.36	.19	.33	300
III	.38	.35	.40	278
IV	.31	.22	.43	236
V	.35	.26	.44	279

It is seen that the correlation coefficients for Function and Emotionality are between .3 and .4 and are slightly higher than those for Activity. These results are not particularly satisfactory, but the following facts must be borne in mind:

¹ Calculations done by Research Staff, Aptitude Tests Section, S.A.A.F.

(1) Certain behaviour characteristics are more easily detected on some tests than on others because of the differently structured test situations.

(2) A particular candidate may find one test considerably more difficult than another and because of the additional stress involved in doing the difficult test he may, in that situation, exhibit certain behaviour characteristics which would not be evident when he was doing a test which he found easy.

(3) The Primary Functioning individual is volatile and variable by definition and may thus behave differently during the relatively short periods of time required for the completion of the different tests.

It is therefore inevitable that there will be a certain amount of disparity in the individual ratings. Noting what is common to these ratings should give a reliable result. The possibility that these relationships could have occurred by chance is virtually ruled out according to the values of the ratios of the correlations to their respective standard errors, which are given in the following table.¹

Table IV.

Tester	Function	Ratio $\frac{r}{SE}$	
		Activity	Emotionality
I	7.55	8.12	5.77
II	7.20	3.39	6.47
III	7.45	6.60	3.00
IV	5.25	3.55	8.11
V	6.73	4.64	9.17

As is to be expected, the reliability coefficient for the final temperament and personality assessment made by the interviewing officers is much higher. In the routine testing for the Air Force it was obviously not possible to have each recruit assessed by a number of interviewing officers. A reliability coefficient was obtained by resorting to the following procedure. Three interviewing officers each reassessed more than 600 files containing testers' temperament assessments and personality summaries, brief biographical inventories

¹ calculations done by Research Staff, Aptitude Tests Section, S.A.A.F.

and rather scant notes on the information obtained in the interview. A nine-point scale was used, and the values of χ^2 and C for these three assessors, together with the number of cases (N) are given below:¹

Table V.

χ^2			C			N					
1	2	3	1	2	3	1	2	3			
1	-	938.9	632.6	1	-	.77	.71	1	-	619	624
2	938.9	-	530.4	2	.77	-	.68	2	619	-	625
3	632.6	530.4	-	3	.71	.68	-	3	624	625	-

These figures are fairly satisfactory, but nevertheless probably underestimate the relationships that exist. If the wealth of data that are available, as the scheme is in operation at present, were utilised for this investigation, it is considered that the coefficients would be materially increased.

This procedure of correlating a measure with a combination of a number of measures all purporting to measure the same function is sometimes alluded to as an "indirect" measure of validity. The measurement of validity in terms of some outside and independent criterion is usually more stringent a test and sometimes more illuminating. Although these temperament and personality assessments were made primarily with a view to predicting adjustment under flying stress and battle conditions, they were shown to have some validity as judged by the external criterion of success or failure at Flying Training School. A group of 180 cases was assessed independently by five assessors, and the sum of these assessments calculated. The cases were divided into two groups: (a) those who had been passed (141 cases) and those who had been grounded (39 cases) at Flying Training School. A biserial correlation was calculated with the measure obtained above.¹

$$r(\text{bis}) = .45$$

$$\frac{F}{SE} = 5.0$$

In terms of probability, the chances are 99.99 in a 100 that the

¹ Calculations done by Research Staff, Aptitude Tests Section, S.A.A.F.

relationship is not fortuitous and seems to indicate that the temperament and personality assessments have some bearing on the success or failure of the candidate at Flying Training School.

All the pilots who broke down under operational stress were returned to South Africa and were seen by the psychiatrist at the Central Medical Establishment and by S. Biesheuvel. On the basis of his findings and the opinion of the C.M.E. psychiatrist, Biesheuvel classified the cases into five groups according to predisposition to affective disorder. 0 signified no predisposition and 4 severe predisposition. "Combining groups 1 and 2, 3 and 4, we find the following incidence of Final Personality Assessments, as determined at the time the candidates were originally tested."¹

Table VI

Personality Assessment	Predisposition Groups		
	0	1 - 2	3 - 4
1	0	0	0
2	37.5	18.4	9.1
3	50.0	55.2	36.4
4	12.5	22.4	39.3
5	0	4.0	15.2

The personality assessments range from 1 (very favourable) through to 5 (very unfavourable) and it is seen that there is a relationship between predisposition to affective disorder caused by flying stress and these assessments. There is not a single case in the break-down group assessed as of very favourable personality make-up, and as predisposition increases the distribution of personality assessments in the group becomes progressively more negatively skewed.

The final personality assessment, made with complete knowledge of the testers' temperament assessments and personality summary, the information from the biographical inventory, and the results of the interview, is the most important single assessment of the general adjustment and integration of the individual. Since it is based on and includes the individual temperament assessments, a demonstration of its validity is also a demonstration of the validity of the particular temperament rating scheme employed. In this scheme it is emphasised

¹ Biesheuvel, S. (28) p. 29

that a superficial knowledge of the variables and a mere summing of behaviour units will not give an adequate picture of the personality. The behaviour must be seen as a whole and in the light of the dynamic inter-relationships between the variables and the modifying influences of one variable upon another. When done in this fashion the ratings of the individual variables of Function, Activity and Emotionality will be meaningful and coherent. It is of importance and interest to check the ratings of the individual variables against some external criteria of behaviour.

One of the functions of the psychiatrists comprising the Disability Board which interviewed all pilots who were returned from the battle area as operational break-down cases, was to classify them according to the particular disability from which they were suffering. A. Plaut, a C.M.E. psychiatrist, investigated the incidence of test-retest ratings of the individual variables of Function, Activity and Emotionality in the different disability groups. He found that those diagnosed as "Anxiety States" had a higher Emotionality rating than a control group, ratio D to SE of D = 2.79.¹ There is an obvious and logical connection between the variable as defined and the disorder, which requires no further comment.

A group of pilots diagnosed as suffering from "Hysteria" tended to be more Primary Functioning than a control group, ratio D to SE of D = 2.05.² This ratio is hardly high enough to warrant any categorical statements, but the relationship is logical in terms of the definition of Primary Function. Primary Functioning Individuals are mobile and impulsive, responding to the stimulus of the moment without reference to previous experience. Their conscious field is wide, but shallow and shifting and leading in extreme cases to a mental life lacking in coherence and integration. It seems likely that this type of behaviour could, under stress, lead to hysterical reactions and dissociation symptoms.

1 Plaut, A. (29) p. 29

2 Loc. cit.

Those pilots whose complaint was diagnosed as "Character Defect" rather than Affective Disorder were found to be more Primary Functioning (ratio D to SE of D = 3.12) and less Active (ratio D to SE of D = 2.38)¹ than the control group. It seems plausible that strong Primary Function combined with the apathy and the lack of vigour and determination characteristic of Inactivity will militate against strong self-identifying concepts or character formation as defined as an "Integrated system of traits or behavior tendencies which enables one to react in a relatively consistent way in respect to moral issues or mores despite obstacles."²

In a comparison of a group of approximately 200 pilots who had sustained one or more accidents during the course of their training at Flying Training School with a group of approximately 400 pilots who had not had any accidents during the course of their training, the writer found that the accident group were more Primary and more Emotional. In this instance all the individual testers' assessments of the variables for these cases were taken into consideration, they were given equal weight and were not averaged. The ratios D to SE of D were 2.89 and 3.25 for Function and Emotionality respectively.³ These findings were confirmed in subsequent investigations of accidents occurring at Operational Training Units. It needs no stretch of the imagination to see how impulsiveness, variability and distractibility which characterise Primary Function especially when allied with Emotionality and possible flusterability may lead to accidents.

On consideration of the data presented here the following points are noted in connection with the Heymans-Wiersma scheme of temperament assessment as applied in the Aptitude Tests Section and the wider field of industrial research:

(1) The scheme is relatively simple, obviously practical and can be applied when dealing with relatively large numbers of people.

(2) The results which have been achieved by the application of this scheme are encouraging, especially the indications of validity

1 Plaut, A. Loc. cit.

2 Murphy, Gardner (17) p. 981

3 White. M.E. (31) pp. 59, 60

in terms of external criteria. Although by no means conclusive, the results warrant further research work and a further investigation of the potentialities of this method of temperament assessment.

(3) The theories of temperament and personality on which the scheme is based find credence and acceptance amongst contemporary psychologists. G. W. Allport states: "Temperament, like intelligence and physique, might be said to designate a certain class of raw material from which personality is fashioned. Strictly speaking there is no temperament apart from personality, nor any personality devoid of temperament. It is merely convenient to employ the term in speaking of dispositions that are unchanged from infancy throughout life (dispositions saturated with a constant emotional quality, with a peculiar pattern of mood, alertness, intensity or tonus). The more anchored a disposition is in native constitutional soil the more likely it is to be spoken of as temperament."¹ He goes on to give the following definition of temperament which he states fits standard psychological usage and meets the requirements of his book: "Temperament refers to the characteristic phenomena of an individual's emotional nature, including his susceptibility to emotional stimulation, his customary strength and speed of response, the quality of his prevailing mood, and all peculiarities of fluctuation and intensity of mood; these phenomena being regarded as dependent upon constitutional make-up and therefore largely hereditary in origin."²

(4) In this scheme it is assumed that the three variables are unitary, that is distinct from one another and with no overlap. In his investigations Biesheuvel found a slight overlap between Secondary Function and Activity. (See Table II on page 42). Biesheuvel maintains that this is an apparent overlap due to the fact that limited Activity would be more easily discernible in the perseverative Secondary Functioning individual, who would conserve what

¹ Allport, Gordon W. (1) p. 53

² Ibid., p. 54

little Activity he had, than in the Primary Functioning Individual who would dissipate what Activity is present through his variability and distractibility. This condition would militate against a clear cut recognition of the variables. This is an entirely logical argument and may indeed be the case.

In this connection it is interesting to note that Heymans found that the particular temperament ratios (typological groups) occurred in very similar proportions in his two investigations. These figures are given below¹ and the writer has added the percentage columns in order to facilitate the comparisons.

Table VII

Type	Symbol	Biographical Investigation		Questionnaire Investigation	
		Number	Percentage	Number	Percentage
Amorphous	PIN	0	0.0	98	3.9
Apathetic	SIN	0	0.0	94	3.7
Nervous	PIE	20	19.6	174	6.9
Sentimental	SIE	14	13.7	113	4.5
Sanguine	PAN	10	9.8	95	3.8
Phlegmatic	SAN	21	20.6	439	17.4
Choleric	PAE	16	15.7	257	10.2
Passionate	SAE	21	20.6	597	23.7
Unspecified				656	26.0
Total		102	100.0	2523	100.1

He points out that in both investigations the Passionate and Phlegmatic types predominated, Nervous and Choleric types were in the middle range, and Sanguine, Amorphous and Apathetic types appeared only in small numbers. He mentions too that this occurrence may not be purely coincidental but may indicate a real relationship. In his own words: "Es mag Zufall sein, darf aber doch nicht unerwähnt bleiben, dass jene ersteren und diese letzteren Zahlen im grossen und ganzen einen unverkennbaren Parallelismus zeigen: nach beiden Untersuchungen sind Passionierte und Phlegmatiker am Zahlreichsten, Sanguiniker, Amorphe und Apathiker am wenigsten zahlreich vertreten, während Nervöse und Choleriker in der Mitte stehen."²

These findings are particularly interesting in view of the fact that similar proportions of these typological groups were ob-

1 Heymans, G. (10) p. 270

2 Loc. cit.

tained in the Aptitude Tests Section from unselected samples. The only data which are available at the time of writing are those obtained from the investigation of "The Prediction of Susceptibility to Accidents" mentioned on page 51. The Accident and Control groups were combined and the following figures obtained.¹

Table VIII.

Type	Symbol	Number	Percentage
Amorphous	PIN	9	.42
Apathetic	SIN	23	1.32
Nervous	FIE	11	.51
Sentimental	SIN	13	.61
Sanguine	PAN	161	7.51
Phlegmatic	SAN	706	32.94
Choleric	PAE	485	22.65
Passionate	SAE	730	34.06
Total		2143	100.00

Once more, the Passionate and Phlegmatic types predominate, Choleric is in the middle range and Sanguine, Amorphous and Apathetic types appear in considerably smaller numbers. The only appreciable differences occur in the Nervous and Sentimental types which appear in smaller numbers here than in the Heymans investigations. The reason for this discrepancy is as follows: Candidates who were assessed as Inactive, and especially those in which Inactivity was combined with Emotionality were given a poor prognosis as prospective operational pilots by the Aptitude Tests Section, and unless they possessed other exceptional compensating qualities they were not accepted for aircrew training. The small percentage of Nervous and Sentimental types can thus be regarded as due to the selection procedures of the Aptitude Tests Section.

Heymans studied the percentage incidence of Active and Inactive, Emotional and Non-Emotional individuals in his Primary and Secondary Functioning groups respectively, and so on for all other possible combinations. He came to the tentative conclusion that Primary Function seemed to be positively associated with Emotionality but negatively with Activity, and that Secondary Function seemed to be positively associated with Activity but negatively with Emotionality. To quote his statement: "Es sieht also dannach aus, als

¹ White, M.E. (1941), p. 55

ob die Primaerfunktion mit Emotionalitaet und Mangel an Aktivitaet, die Sekundaerfunktion mit Aktivitaet und Mangel an Emotionalitaet in Korrelation Stuede."¹ He gives some discussion of this and makes the interesting suggestion that it is possible that there may be races or nations in which certain temperament types predominate. This seems to be a possibility. Heymans' subjects were predominantly Dutch and German, and it may not be too far-fetched an argument to explain the correspondence in the proportions of temperamental types obtained in Heymans' investigation and in South Africa as due to the fact that in general South Africans are descendants of Western European stock.

The writer calculated chi square coefficients for Function and Activity, Activity and Emctionality, and Emotionality and Function respectively, using the figures obtained by Heymans in his Questionnaire Investigation. The tables of figures, together with the chi square coefficients calculated by the usual formula for four fold tables are given below:

$$\chi^2 = \frac{(ad - bc)^2 N}{(a+b)(c+d)(b+c)(a+c)}$$

Table IX.

	A	I	Total		A	I	Total		E	N	Total
S	1036	207	1243	E	854	287	1141	P	431	193	624
P	352	272	624	N	534	192	726	S	710	533	1243
Total	1388	479	1867	Total	1388	479	1867	Total	1141	726	1867

$$\chi^2 = 158.0$$

$$\chi^2 = .4$$

$$\chi^2 = 25.0$$

Two of these chi square coefficients (158.0 and 25.0) are significant at the one per cent level. A definite relationship between Secondary Function and Activity must be acknowledged, as also a fairly strong relationship between Primary Function and Emotionality. Biesheuvel has commented on, and given an explanation for the relationship between Secondary Function and Activity, but the possibility that these relationships are not an artifact of the difficulties of rating or the particular individuals studied, but are inherent in the qualities of the variables themselves, must be considered. This is a question

¹ Heymans, G. (10) p. 271

which is of theoretical and practical importance.

In the past there has been a tendency in psychological work to insist upon zero correlation between the measures purporting to define certain aspects of the personality. On the other hand no stipulations of this sort are made for measures referring to the physical attributes of the individual. For instance, height and weight are regarded as useful measurements in the description of physique. Or again, there are stipulations as to height and leg-length in the selection of people to be trained as pilots. These pairs of measurements are meaningful and extremely useful in certain situations, yet we know that they are not uncorrelated. The tendency in current psychological thought seems to be a greater acceptance of degrees of dependence between groups of traits. In fact if the traits are describing aspects of the same functioning system it seems that one should expect, or at least accept, the fact of coherence between them.

In this survey of the Heymans-Wiersma scheme it appears that the results already achieved are promising and justify further research. In connection with the question concerning the degree of dependence between these variables, the following quotation seems pertinent: "From this point of view, it would seem likely that people can be arranged in continua with respect to two or three traits at a time, and that this can be done more easily if the traits are correlated. Indeed, people might be arranged in continua having many dimensions, just as plants or shells are arranged for a natural history exhibit, on the basis of the complex structural relations of many parts. This approach to personality continua is, however, almost unexplored."¹

(5) Heymans' first investigation was biographical in nature, he carried on his investigations with a questionnaire study done on a very much larger scale. In his investigations, Biesheuvel adopted the broad lines of the Heymans' questionnaire technique, as a result of these findings the rating scale employed in the Aptitude Tests

¹ Murphy, Gardner (17) p. 734

Section was devised. It is feasible that these investigations are dealing with the same area of temperamental make-up. The question then arises as to whether the investigations are dealing with the total area in the domain of temperamental make-up, and following on this, the possibility of the inclusion of additional variables as an amplification of the scheme must be considered. A first step to test the width of application of the Heymans-Wiersma scheme would be to compare the variables which it employs with those isolated by entirely different investigators who had different objectives in mind. In the following chapter the factors isolated by J.P. Guilford and H.G. Martin, which are purported to cover the areas of personality traditionally known as "introversion-extraversion", "paranoid tendency" and "vigorous activity, ascendancy, masculinity, selfconfidence and lack of nervousness" are studied.

CHAPTER IV.

THE PRELIMINARY INVESTIGATION

- (a) Description of thirteen personality factors obtained from inventories by J.P. Guilford and H.G. Martin.
- (b) Description of the nine personality factors obtained by L.L. Thurstone as a result of his re-analysis of the Guilford-Martin factors.
- (c) Second-order analysis of the nine primary factors obtained by L.L. Thurstone.
- (d) Interpretation of the second-order factors.

Among the rapidly increasing number of investigations which have as their purpose the identification and assessment of independent variables of temperament by factor analysis methods, those by J.P. Guilford and H.G. Martin are well known, and their resulting self-rating schedules enjoy a fairly wide-spread application.

One of Guilford's schedules is entitled "An Inventory of the Factors S T D C R."¹ The inventory consists of 175 items which were retained after successive tests of internal consistency of the responses of 400 university students who were predominantly at the sophomore level.

It is stated that the factors S, T, D, C and R taken together were found to encompass the area of personality traditionally known as introversion-extraversion, and are specifically defined as follows:²

S - Social introversion-extraversion. Shyness, seclusiveness, tendency to withdraw from social contacts, versus sociability, tendency to seek social contacts and to enjoy the company of others.

T - Thinking introversion-extraversion. An inclination to meditative or reflective thinking, philosophizing, analysis of one's self and others, versus an extravertive orientation of thinking.

¹ A copy of this inventory is included in the appendix.

² Guilford, J.P. (32)

D - Depression. Habitually gloomy, pessimistic mood, with feelings of guilt and unworthiness, versus cheerfulness and optimism.

C - Cycloid disposition. Strong emotional fluctuations, tendencies toward flightiness and emotional instability, versus uniformity and stability of moods, evenness of disposition.

R - Rhathymia. A happy-go-lucky, carefree disposition, liveliness, impulsiveness, versus an inhibited, over-controlled, conscientious, serious-minded disposition.

A second inventory entitled "The Guilford-Martin Personnel Inventory"¹ was designed with two purposes in mind, one being an extension of the temperament traits already assessed by the inventory of the factors S, T, D, C, R, the second and more important being the location of potential troublemakers in industry in advance of their being hired. In other words the diagnosis of individuals who are personally maladjusted to their jobs and therefore likely to become trouble-makers.

It is stated that: "The temperamental area covered by the new inventory may be roughly designated by the term 'paranoid' though only the extreme symptoms deserve that appellation borrowed from psychopathology. The new Inventory, therefore, has general clinical applications which extend beyond the industrial situation."²

The aspects of the paranoid disposition assessed in this inventory are: (1) subjectivity, (2) belligerence, and (3) suspiciousness and faultfinding or hypercriticalness.

The test consists of 150 items which were shown to be diagnostic and which were retained after a test of internal consistency had been applied to the responses of 250 men and 250 women workers who were or had been employed by a number of California industrial concerns, business offices, and civil service units.

Using the names of the more favourable end of the scale in each instance, the traits measured by the inventory are described as follows:²

1 A copy of this inventory is included in the appendix.

2 Guilford-Martin (34).

Author Baehr Melany Erna

Name of thesis An Investigation Into The Determinants Of Temperament. 1987

PUBLISHER:

University of the Witwatersrand, Johannesburg

©2013

LEGAL NOTICES:

Copyright Notice: All materials on the University of the Witwatersrand, Johannesburg Library website are protected by South African copyright law and may not be distributed, transmitted, displayed, or otherwise published in any format, without the prior written permission of the copyright owner.

Disclaimer and Terms of Use: Provided that you maintain all copyright and other notices contained therein, you may download material (one machine readable copy and one print copy per page) for your personal and/or educational non-commercial use only.

The University of the Witwatersrand, Johannesburg, is not responsible for any errors or omissions and excludes any and all liability for any errors in or omissions from the information on the Library website.