THE
JOURNAL OF MENTAL SCIENCE
[*Published by Authority of the Royal Medico-Psychological Association.*]

No. 355 [NEW SERIES No. 319.] MARCH, 1939. VOL. LXXXV

Part I.—Original Articles.

METHODOLOGICAL CONSIDERATION OF JUNG'S TYPOLOGY.

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(Received November 23, 1938.)

INTRODUCTION.

JUNG wrote his *Type Psychology* in 1914, but does not seem to have developed any further its general thesis. The terms "introvert" and "extravert", however, have slipped into everyday language, and experimental studies and questionnaire inquiries on introversion-extraversion continue to be published in psychological journals. Ink-blots, ambiguous figures, and even knee-jerks are called upon to measure this fundamental tendency of man; inventories and self-rating sheets are employed widely to estimate it; and yet it appears to evade capture. There is as yet little or no evidence anywhere that a coherent tendency of the kind looked for does in fact exist.

Underlying this previous work on introversion-extraversion, whether experimental or based on ratings, there has been the notion that a simple one-to-one relation should be expected between the fundamental tendency on the one hand, and any transient reaction of the person on the other. This, in my opinion, is a vain expectancy. We should see, rather, infinite complexity in the connections between introversion-extraversion and any personality. In the following pages, therefore, I propose that the simple one-to-one relationship should be replaced by a statistical one, which tries to take account of the highly ramified ways in which introversion-extraversion subserves a personality. This conception leads us to a simple representation of Jungian types, and does justice, I think, to Jung's mode of thought.

To see his system of typology in perspective it is necessary to range further afield than into Jung's book, and in what follows I have drawn freely upon the wider body of psychology and psychotherapy.

Types as Universal Functions.

The word " type " has as many meanings as almost any word in psychology. One, purely classificatory, scarce needs mention. All women with blond hair have been regarded as of a type on that account ; men with convex or with concave facial profiles have also been regarded as types. Some people nibble the loose crumbs on the table at dinner, and others brush them into a neat pile ; very soon we begin to talk about crumb-picking and crumb-brushing types. Typification of this kind is purely classificatory, and its value to psychology cannot be much greater than attaches to the classification of books in a library into all those of *folio*, *quarto* and *octavo* sizes respectively. It is because Rorschach testing (Beck (1937)) involves so much of this kind of elementary classification into types that some of us feel dubious about its pretensions. Typification of this kind is usually gratuitously invested with properties that far transcend the mere classification, which itself is harmless enough. Very soon blond women are all regarded as potential Mae Wests ; crumb-nibblers are felt to be mean and depressive, crumb-brushers profligate and manic ; and people who pay attention doggedly to the white spaces surrounding the Rorschach ink-blots, after the blots themselves have been exhausted, are considered to have an inner capacity for strong *will* and determination (Beck (1937)). The detail that individuals have in common is presumed to be indicative of more general tendencies, of the very essence of their personalities. It usually takes psychologists a few decades to marshal facts which show how little there is in these *ad hoc* suppositions and wilful additions to the original classifications.

When psychiatrists classify their patients into reaction types (Henderson and Gillespie (1927)), or subnormal types of various kinds, the classification is based on far more than one manifest detail that the cases of a type have in common. Each type is a compilation of many traits and symptoms, and any individual of the type will have many of these, or similar ones, in his make-up. Thus psychopathic inferiors (Norwood East (1936)) tend to be eccentric, stubborn, hostile, reckless, quarrelsome, irritable and excitable ; they are given to depression, confusion, ideas of persecution and delusions ; and they are cranks, eccentrics, chronic drunkards and sexual perverts. But any particular psychopathic inferior will not have all these qualities ; it is sufficient if some of them, in the characteristic way of the type, are dominant in his personality.

It seems to me that Jung's types are methodologically of the latter kind. Jordan's description of a typical extravert woman (see Jung (1923), page 195), which Jung amplifies, consists of a long list of traits, strung together with literary skill ; but the description could represent a real woman. Other women of this same type need not have all this long list of traits dominant in their personalities, but they must have some, or many like them. The "typical" woman, indeed, is little more than a compilation of all the qualities that enter

into all the persons classified into a type; each individual contributes only some of the qualities, and few have all the qualities in their personality. The description of personalities that so distinguishes Jung's work is at first sight little more than a kind of literary composite photography.

Actually it is much more. Each reaction-type or personality-type is thought of as dependent upon a few inner and fundamental tendencies, usually of a constitutional, innate, or relatively permanent nature. Whatever form the manifest behaviour of a psychopathic inferior may take, however transient may be his particular reactions, something akin to emotional instability, uncontrolled and innate, underlies all. The overt behaviour may take different forms, but the inner and more fundamental make-up of the individuals of such a type is the same in all. Typology of this kind, and the supposed fundamental tendencies that subserve a type, is examined methodologically in the following section.

Basic Formulations: (*a*) Mathematical.

In all typology of the kind just discussed the initial concern is with the overt behaviour or characteristics of individuals. The psychotherapist's diagnosis begins with the observation of such raw data. For convenience I propose to represent the data as follows:

$$\text{data} \equiv (a, b, c, d \ldots n) \quad . \quad . \quad . \quad (1).$$

Thus in Jungian typology, $a, b, c \ldots$ could be the personality traits that require looking at from the standpoint of a theory of introversion-extraversion; or they could be scores obtained by a person in certain tests which are meant to measure introversion-extraversion. Likewise in Spearman psychology the original data may be the marks obtained by a person in some intelligence tests. Quite generally (1) stands for data, to be considered for any reaction type, or personality type.

Each item of the data is merely a transient reaction of the individual; but we have the view that each is explained, or subserved by, or dependent upon, a more permanent underlying tendency that gives it part at least of its essential character. That is, we have to contemplate some kind of relationship between the items of data on the one hand, and one or more underlying and possibly fundamental tendencies on the other.

Spearman sought to represent this relationship mathematically.

If we consider the simple case of one presumed underlying tendency (Y), which subserves all the data, Spearman asks us to contemplate a connection between it and Y by equations of the kind:

$$\left.\begin{aligned} a &= f\ (Y) \\ b &= f'\ (Y) \\ c &= f''\ (Y) \\ &\ldots \text{ etc.} \end{aligned}\right\} \quad . \quad . \quad . \quad . \quad . \quad (2).$$

Here the same Y is involved in each item of data, but the functions f, f', f'' may be different.

The quantities and qualities under consideration at (1) are relatively non-inferential; they are raw phenomena, although often already very greatly tampered with, owing to the inevitable formation in our minds of concepts. (Traits are often so tampered with.) For the main part all the data are statements about a person that involve relatively little technical or scientific knowledge. When we say, for example, that Mrs. Smith has palpitations, headache, stabbing pains over the heart, and anxieties; that she sleeps badly and fears that she has cancer; that she lacks self-confidence, and has nervous mannerisms; then we are dealing with data much of which could be described by almost anyone, including Mrs. Smith herself. Data of this kind are contemplated by (1) above.

But when the psychiatrist diagnoses Mrs. Smith as a case of anxiety neurosis he is no longer speaking the language of data, but, however vaguely, the language of "constructs" (Brown, 1936). Mrs. Smith might say or guess that she is such a case; but the psychiatrist does not depend on hearsay or guesswork; the full implications of his diagnosis, and of the term "anxiety-neurosis", can only be appreciated by psychiatrists trained alike.

Even more so, the functions (f) at (2), and the presumed fundamental tendencies such as Y, are no longer data, but *constructs*—matters for technical treatment. They are inferential and assumptive in nature.

To make a practical beginning, Spearman connected the data of (1) to fundamental tendencies by a simple linear mathematical relationship, which I represent as follows:

$$a = \alpha Y + \varepsilon \quad . \quad . \quad . \quad . \quad . \quad (3)$$

Here one item (a) of the data is linearly related to one underlying tendency Y, the values α and ε being constants. If this same tendency (Y) enters into all the data in this same fashion, then for one person under consideration we could write:

$$b = \beta Y + \varepsilon',$$
$$c = \gamma Y + \varepsilon'',$$
$$\ldots \text{ etc.,}$$

where Y is constant in all the data, but where the mathematical constants α and β, etc., may be different for each.

It is not necessary here to go into all the details and consequences of this particular mathematical representation. It is sufficient to draw attention to the general method and its attendant conceptions. The mathematics can be pursued to its logical end, and we can seek to determine how far the original data square with the mathematical theorems. If agreement is found, then some

scientific justification is found for the subsequent language of "constructs" by which we "explain" the original data.

Thus, when Spearman concerned himself with character traits, he found with Webb (1919) that they did in fact satisfy the simple consequences of formulæ such as (3). The common underlying tendency in this case was called "*w*"; in its purely mathematical setting it was called *w*-factor, but it was conceived of as the fundamental integrating tendency (Spearman, 1930) in personality, the underlying basis of character. Essentially the same treatment underlies Spearman's famous *g*-factor. A person with high *g* tends to score highly in *all* tests of intelligence; the common underlying tendency is *g*-factor, and this is conceived of in the language of constructs as general (cortical) energy, or as eduction. Each of the well-known Spearman factors, as well as the same factors dressed up anew by later workers such as Thurstone (1935) and Kelley (1928), have this kind of methodology behind them. In each case a very simple *functional* relationship is contemplated that connects an item of data (1) to underlying tendencies (2). So simple is the functional connection, indeed, that the two, data and fundamental tendency, can be regarded as *tending* to be directly proportional to one another.*

Now Jungian psychology contemplates data such as (1). And no less than in Spearman psychology it has postulated certain fundamental tendencies that "explain" or underlie the data. Jung, however, has nowhere formulated these tendencies mathematically, nor have any functional connections been considered that connect the inner tendencies to the transient reactions. Even to suggest to him that his mode of thought *could* be represented mathematically might stir up at most a smile of condescension.

In any case in Jung's typology there appear to be five major tendencies, Introversion-extraversion (I-E), and Sensory (S), Thinking (T), Intuitive (U), and Feeling (F) tendencies. I have not the slightest doubt but that these Jungian tendencies could be reduced to mathematical formulations, and that a school of Jungian factorists could build up an edifice of scientific evidence on these five foundation stones. Indeed one might expect connections somewhere between Feeling (F) and the Spearman factor of general emotionality (*e*, Burt (1938)); likewise between Sensory (S), Thinking (T), and Intuitive (U) tendencies and the Spearman *g*-factor.† Moreover, introversion-extraversion is a tendency for the individual to act one way or the other, a mechanism that can be inserted or disconnected at will, and one might no less expect connections between Spearman *w*-factor and Jungian I–E; very possibly extremes of either introversion or extraversion are related to inadequate *w*.

That is, the underlying fundamental tendencies in the two psychologies could well supplement each other—for in truth both merely embrace the

* This needs qualification, but is substantially true in practice.

† By this I do not mean that *g* will embrace Jung's S, T and U completely; it is certain that special Spearman factors (*group* factors) could be found to cover these three Jungian tendencies, and that all would have at least some *g*-content.

classical differentiation of individual psychology into cognitive (*g*, S, T, U), feeling (*e*, F) and directional (*w*, I-E) tendencies.

As I have said, however, Jung's tendencies have yet to be represented mathematically, and this in turn used as the basis of systematic experimental work. I doubt very much, however, whether Jung would contemplate the kind of *functions* involved in factor analysis, even supposing for a moment that he was disposed to try to reduce his typology to mathematics. Things are not quite so simple, he would say, as a direct and simple proportional relation between any trait of a type, and the underlying tendencies subserving the personality. Something far more complex is involved.

Basic Formulations: (*b*) Statistical.

In the above paragraphs I have purposely expressed the relationships under consideration in terms of only *one* fundamental tendency, but of course similar mathematical formulations can be given for several underlying tendencies. The hypotheses, and mathematical theorems, are dealt with very adequately in modern factor analysis. But other relationships besides mathematical ones may be used to relate the raw data of (1) to one or several underlying constructs. Jung, like most psycho-analysts, only contemplates a descriptive, *historical*, relationship; the individual's reactions depend upon his life, or even his racial, history. This mode of explanation is satisfactory as far as it goes, but we should also try to explain each particular situation in its more immediate context. Even in the course of a psycho-analysis the changes and processes at work in the individual here and now, his mode of thinking, feeling and direction in the present state of his development, are clearly worth at least as much scientific regard as what has happened to him in the past. That is, we have to consider the personality as it is now, and our explanations should be *a*historical as well as historical (Lewin (1936)). Spearman "constructs", e.g., general mental energy, are of this ahistorical kind. We need some kind of representation of the relation between data and constructs, of a kind that will take due account of the system and ideas of typology outlined by Jung. The thesis I wish to elaborate is that purely statistical connections can be used, instead of mathematical ones, to relate the active present personality to its underlying tendencies.

Statistical methods are involved in the basic formulations already described in the previous section; but these pertain to the persons as units of a statistical population, and not essentially to the dependency of an item of data upon an underlying tendency or tendencies. Nor is it necessary to point to the view, held by Spearman and Thomson alike (see Spearman (1928)), that any construct such as *g* can be regarded as having a sub-structure of innumerable smaller components; these components are additively related, and the concern is

still essentially mathematical rather than statistical. Statistics deal with frequency distributions, and I propose to postulate a frequency distribution for each person, for the whole population of his data (1), where each item of data deviates quantitatively from an average, owing to the joint effect of a very large number of causes, each of which is of small influence only. *The data, that is, themselves form a frequency distribution; this describes the present personality; and the thesis is that the underlying fundamental tendencies are such highly complex causal agencies, that no simple mathematical relationship can possibly represent the way in which they ramify into the personality data.*

That is, instead of the function (2), we have to contemplate a relationship

$$y = \kappa e^{-\phi x^2} \quad . \quad . \quad . \quad . \quad . \quad (4).$$

where x is the quantity given to an item of data, and where κ and ϕ are not independent, but are independent of x; and where the fundamental tendency or tendencies are regarded as causal agencies producing the given frequency distribution in all its statistical detail. These causal agencies could be ahistorical—and as Prof. Thomson has often said in other connections, the view that innumerable small influences, related in vast complexity to the neural system, and to a constant reflux of numberless co-existing impulses, might more reasonably be given as a statement of the underlying tendencies at work in personality.

This does not mean that the result, or the causes, are chaotic; but only that the causal agencies are at the moment, and perhaps for all time, irreducible to simple mathematical terms, and that statistical regard of them as they relate to the individual is perhaps the only way to deal systematically with them.

Q-Technique and *r*-Technique.

The mathematical basis (p. 187) involves what I have elsewhere (Stephenson, 1936) called *r*-technique; in this technique traits are variables, and persons are items of a statistical population. In the case of the statistical basis (p. 190) persons are to be variables, and *traits* are to be items of a statistical population, a procedure that has been called *Q*-technique.

At first sight it might seem that, after all, the real persons do not alter whether they are regarded as variables or as items of a statistical population; likewise if a trait is now a variable and now a unit of a population, this, to all outward appearances, should not alter the essential nature of the trait itself. Beginning with one and the same group of persons, therefore, and one and the same set of traits, one might expect to obtain similar *results* about them, whichever way the data are approached—whether from the standpoint of *r*-technique, or *Q*-technique. This is what Prof. Burt (1938) maintains; he proves that under certain conditions the same *factors* can be got whichever way we approach the original data.

Yet, if the formulations given above have any point, there is surely a profound difference between the modes of explanation of data in the two cases—in the one case a one-to-one relationship is contemplated between a *factor* (e.g., *g*) and the overt trait or item of datum. This *factor* is usually identified with an underlying tendency, that explains the traits (Prof. Burt, however, regards factors as purely statistical constructions, and is very careful about making such identifications). In the other case the relationship between a trait and its subserving tendencies is considered to be so complex that only a statistical representation of it could do it justice! The one-to-one relationship and the statistical are in this respect the very poles apart. Nor does this concern the mode of "explanation" only, for as we shall see, the factor methods in the two cases are very different. The units are not the same in *Q*-technique and *r*-technique. Factors in the one case merely represent unanalysed *types* as defined later, whereas in the other case the concern is with analytical fundamental tendencies—or else with mere mathematical and statistical artifices. The two, *types* and tendencies, are very different things—as different as Falstaff and his glandular make-up.

Illustrations of these Basic Formulations.

The general descriptions of personality to be found in Jung's (1923) book can now be considered in terms of the above basic formulations and considerations.

The typical introvert woman, to give a simple example of a description quoted by Jung, . . .

> " . . . has quiet manners and a character not easy to read; she is occasionally critical, even sarcastic . . . bad temper is sometimes noticeable, but she is neither fitful nor restless, nor capricious, nor censorious, nor is she a 'nagging' woman. . . . She is sympathetic . . . their passions and emotions are so strong . . . They love too much, but they also hate too much " . . . and so on.

In Appendix I a list of some 500 traits is described which were selected from descriptions of the above kind given on many pages of Jung's book. From this longer list I selected at random a lesser number, 176 in all, and these are to constitute our *data* ((1) p. 187). If need be we could repeat the following procedures with any other sample of traits drawn from the 500, or any larger " population ".

If we wished to base our methodology on mathematical lines (*r*-technique), so as to demonstrate a *factor* that could be called I-E, which in turn could be regarded as a construct concerned with introversion-extraversion as a fundamental tendency, we should proceed as follows: A sample drawn from a population of women (say 100 or 200 women of a particular age) would be

estimated for each personality quality *in turn*, e.g., for manners, critical mindedness, tendency to sarcasm, restlessness, strength of emotion . . . etc., etc. The estimation would have its own assumptions; in particular it would be based on postulates about controlled or averaged situations—i.e., we might ask, what would A's manners be like if all other influences militating against these were controlled? Or we might estimate on the basis of an average of her displays of good manners. Each quality, such as "manners", in effect becomes a variable with respect to a population of women; the different qualities are correlated and factorized; and if any factor or factors appear, that is if the traits correlate one with another, then evidence for the underlying function I-E has been obtained.

In such a case, an extremely introvert person would tend to have *all* the traits of the function in an exaggerated degree in her personality. She would not only be quiet in her manners, but ascetic in them; her character would be inscrutable; she would be given to bouts of acerbatic criticism and to bitter shafts of sarcasm; she would be sympathetic to the point of saintliness, yet her passions would be as strong as a raging fire . . . and so on, each trait in exaggerated degree. On some views* this caricature of a woman would be called the "typical" introvert!

Apart from the difficulty of contemplating any such person, an account of this kind does not fit with the conception that not all persons of a type need have *all* the qualities of that type dominant in their own personalities (see p. 186). Two women might both be introverts, but the one might have traits *a*, *c*, *e*, *f*, *g*, *k* . . ., etc. clearly in her make-up, whereas another might have *a*, *b*, *e*, *f*, *i*, *l* . . ., etc. It is sufficient that each has some traits of the type clearly marked in her personality, but not necessarily that each has *all* in her make-up.

There is a further difficulty that no one could sensibly deal with 176 traits, each estimated separately for a large sample of women; and still more, when attempts have been made hitherto along such lines no factors emerge of any coherency or cogency.

Let us see, then, what the other approach brings in its wake. Every psychiatrist knows what it is to write up a description of the personality or other features of his cases; in his time he "writes up" many patients in case histories. *Q*-technique does much the same thing, only in a more schematic way. Instead of a literary description, such as Jung or any psychiatrist would give about a person P_1, we describe the person in terms of all n traits in the form of a statistical distribution of them. That is, we give *each* of the n traits a mark or score on some basis, to represent its relative dominance or descriptive significance in the personality P_1. But we postulate that these marks will tend to be normally distributed about the common core of the

* For example, the view that regards "typical" persons as the extremes of a normal distribution.

personality P_1—how far this is justified is a matter depending on fact, and practical exigencies. That is, most of the traits, of a large sample, will not be very critical in P_1; only a few traits will tend to be extremely characteristic of P_1 in the *positive* sense; and only few will tend to be as extremely characteristic in the *negative* sense. The various traits will have different degrees of "significance"* of this kind; but these will tend to be normally distributed about the average for the personality P_1. Thus "greed" might be so characteristic of P_1 that no other trait could so adequately describe him; "generosity" will thereby *tend* to be as strongly characteristic negatively. The former trait might be given a score +3 (in *standard* terms) and the latter −3. The trait "gluttonous", on the other hand, might play little part in his personality—he is greedy for money, but no glutton for food; he is neither a gormand nor is he abstemious; food does not matter, is not significant one way or the other in his personality, and this trait might be given score 0.

Statistical description of this kind is done in the following way:

The estimator, it is presumed, knows a great deal about the personality to be described, either as the result of analysing him, or because of long acquaintance with him. With this individual in mind, the estimator (in the study to be reported below this was always myself) picks up the pack of cards which list the 176 traits (see Appendix I), and begins an evaluation of each trait for its relative significance in the personality under consideration. The cards are first thoroughly shuffled and then sorted out into piles, just as they might be in a game of cards, except that now each card is deliberated upon and placed on the pile most suited to the particular trait's place in point of significance in the personality concerned. For practical purposes, because the use of integers facilitate the calculations that have to be made later, the following frequency distribution is made use of:

Score:	0	1	2	3	4	5	6	7	8	9	10
Frequency:	2	4	10	20	32	40	32	20	10	4	2

The two traits which, according to one's judgment, are most characteristic of the person appraised are placed on pile 10, that is, each is given 10 marks; the next four most characteristic traits are given 9 marks each . . . and so on. The two traits most negatively characteristic of all in the personality are given score 0 each; the next four are given score 1 each . . . and so on. In the end, then, each trait obtains a mark to stand for its significance in the personality; and these marks are distributed as shown above. I repeat that one's object is to give a description of P_1, as it is more or less intuitively appraised, the description having a statistical form. Traits so distributed offer a great deal of information about the person, and I am prepared to pit a statistical distribution

* For further information about this concept, see Stephenson (1938).

https://doi.org/10.1192/bjp.85.355.185 Published online by Cambridge University Press

against most literary ones, and to gain as much insight from the one as from the other.

Unlike literary accounts, statistical ones can be audited. If several people are estimated in the above statistical fashion, they can be correlated one with another, and the correlations subjected to factorial analysis. Granted certain assumptions, the frequency distributions for a number of persons $P_1 \ldots P_N$ as variables can be correlated amongst each other for the traits $a, b, c \ldots n$ as a " population ".

One or two assumptions require mention. The form of the distribution is arbitrary, and can only be a first approximation to the actual facts. The fact that a distribution with the same mean and standard deviation is used for all persons alike seems odd until the concept of significance is understood. The trait x that is most significant in P_1's personality is just as important for *that* personality as the trait y (that is most significant in P_2) is in its own personality (P_2). Significance has nothing necessarily to do with quantification of a trait in terms of *individual differences* with respect to a population of persons. I have given some attention to this concept in another paper (Stephenson, 1938), and here it is perhaps sufficient to say that this is a concept especially called for as a result of the increasing attention now given to the correlation of persons, instead of to the correlation of tests and traits, etc. The significance of a trait is what it is relative to other traits in a given personality, in the light of hypotheses and the like of a psychological nature, and not of a statistical nature. When we estimate a trait like " honesty " normally, it is for individual differences, that is, how honest the person is relative to other persons. In the present case no such individual differences are anywhere directly involved ; nor are they necessarily involved even indirectly.

Other assumptions are as follows : Each trait is granted a certain tangibility as an item in a statistical population of traits. For practical purposes this assumption is warranted. Again in making his appraisals the psychologist can be granted an expertness in keeping with his technical knowledge ; but the same personalities can be appraised by different psychologists and the results treated for the familiar errors of estimation. There can always be a proper control of subjectivity introduced in data by one psychologist.

For the purpose of this study I have described statistically some 46 persons, all directly known to me—my adult friends, psychoneurotic patients I have had access to, and members of my own family. But I do not wish to press the validity or objectivity of the appraisals I have made ; it is sufficient for the present purpose if the data are regarded as of illustrative value only to show *how* it can be done, and how to treat the results. In point of fact I have chosen personalities purposely to bring out as clearly as possible the connections between my thesis and Jung's typology. The 46 men and women are in no sense a random sample of individuals ; nor is there any methodological reason why they should be, for in work of the present kind, where persons

are used as variables, they can be selected on other than purely sampling grounds.

Correlations and their Analysis.

For my present purpose it is not necessary to calculate all the inter-correlations (1,035 in all) for the 46 persons. Eighteen of the persons are extraverted in tendency; 16 are introverted; the others have little inter-correlation amongst themselves, or with other persons. They are of no clear type. For convenience I give only the correlations for the two groups of persons amongst themselves respectively. In Table I the 18 extraverts have been inter-correlated, with the results shown. All correlations are product-moment. In Table II the sixteen introverts are intercorrelated. It is not necessary to give another table of correlations, which shows correlations between persons in Table I and those in Table II, and in which all the correlations tend to be *negative*.

The correlations in the two tables I and II are shown in rearranged form, which brings out the essential similarities between particular groups of correlations. Grouping of this kind is readily made empirically, or can be made as the result of previous factor analysis. Table I shows four groups, for persons 1–5, 6–10, 11–14 and 15–18, respectively; each group is distinguished from the others by the higher correlations between the members of the group than with members of other groups. Thus the average correlation for the members of group A amongst themselves is 0·607, the average for group B amongst themselves is 0·642, whereas persons of group A correlate only 0·331 on the average with those of group B. A similar patterning of the correlations is shown for each of the groups relative to the others. Table II likewise shows four groups of persons, persons 31–34, 35–38, 39–42 and 43–46 respectively.

Now in so far as persons 1–18 all correlate positively they may be regarded as persons of a type; the traits most positively significant for the persons all tend to be extravertive (as described by Jung), so that the individuals may be considered to be extravertive in type. Persons 31–46 are dominantly introvertive in type; their most significant traits are introvertive. But over and above these arch-types there emerge the eight types of narrower range; inspection of the traits most significant in the personalities of persons in group A shows them to be *thinking* extravertive; whilst *intuitive*, *sensory* and *feeling* are most significant of the group B, C and D respectively. The corresponding groups on the introvertive side are H, G, F and E respectively —the persons in group H are introvertive, and the traits most significant in their personalities show that the introversion is displayed in *thinking*. The types are named after the dominant traits in the persons concerned; but a full account of each type would require us to describe the common or average significance of *each* trait in the type.

Definition of "Type".

A technical definition is required, however, of the word "type", and I propose to regard *any number of persons* $P_1 \ldots P_N$ *as persons of one type if their inter-correlations satisfy the theorem of two factors, one factor being common to each trait and the other specific to each.* That is, the well-known theorem of two factors, upon which Spearman has founded his theory of two factors in cognitive abilities, is here turned to use in typology. In the theory of two factors the scores supplied by any *person* in a number of *tests* are held to be divisible into two parts, one general to all the scores, and the others specific to each. By specific is meant "uncorrelated", i.e., of the nature of random errors. In the present theory of typology likewise, it is maintained that in the case of persons of one type the scores for significance given to any *trait* in their personality descriptions are divisible into two parts, one common (t) to each trait, and the other specific (e) in each (i.e., a random error). That is, all the postulates and consequences of the Spearman theorem of two factors are applied to the present case of a population of traits, for personalities as variables.

Thus, if a number of persons, correlated amongst themselves for a population of traits which describe them, satisfy the tetrad-criterion (Spearman, 1927), or a Spearman factor analysis, then the necessary evidence has been obtained for maintaining that the traits which have been scored for significance are each divisible into two parts, one common (t) and the others specific (e) to each trait; the persons so correlating will by definition be called persons of a type.

Consider, for instance the persons in group A. These persons satisfy the theorem of two factors amongst themselves—it can be demonstrated either by constructing the familiar tetrad-differences, or by conducting a straightforward factor analysis based on the assumption that the correlations *do* in fact satisfy sampling conditions for zero tetrad-differences. In the latter case the t-saturation is calculated for each person in terms of the other persons of the same (for the moment, presumed) type, using the Spearman (1927) formula 21; viz., for person A,

$$r_{At} = \left(\frac{A^2 - A''}{T - 2A}\right)^{\frac{1}{2}} \quad . \quad . \quad . \quad . \quad . \quad (5).$$

First residuals are then calculated; thus for the two persons 1 and 2,

$$r_{12.t} = r_{12} - r_{1t} \cdot r_{2t} \quad . \quad . \quad . \quad . \quad . \quad (6).$$

If these residuals for all the persons of the (still presumed) type are insignificant as judged by the probable error of the differences involved, then it is permissible to regard the type as "proved", and no longer as merely presumed. If the residual differences (6) are not insignificant, then the presumed type is not "proven", and other hypotheses will be necessary. I place the word "proven" in inverted commas to remind the reader that the evidence is

TABLE I.—*Showing Product-moment Correlations for* 18 *Persons, for a Population of* 176 *Personality Traits.*

EXTRAVERTIVE.

	Type A (Thinking).					Type B (Intuitive).					Type C (Sensory).				Type D (Feeling).			
Persons	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	—	703	656	630	671	472	480	370	444	460	213	240	166	197	207	165	187	244
2	..	—	658	541	527	300	261	185	239	285	146	163	184	213	176	283	139	291
3	..	..	—	603	503	303	270	319	282	300	160	204	200	190	141	045	194	−065
4	..	..	..	—	573	390	377	232	340	278	286	202	253	186	222	199	214	220
5	..	..	..	..	—	367	378	366	244	348	171	122	137	056	091	205	152	255
6	..	..	..	..	..	—	795	753	680	573	350	394	320	225	339	372	365	243
7	..	..	..	..	..	..	—	745	660	500	428	442	379	238	205	486	302	204
8	..	..	..	..	..	..	..	—	606	593	370	367	290	287	435	312	277	267
9	..	..	..	..	..	..	..	..	—	517	353	370	267	240	316	389	436	216
10	..	..	..	..	..	..	..	..	..	—	352	445	356	320	257	314	392	350
11	..	..	..	..	..	..	..	..	..	..	—	614	544	536	413	483	402	335
12	..	..	..	..	..	..	..	..	..	..	..	—	537	571	461	514	534	365
13	..	..	..	..	..	..	..	..	..	..	..	..	—	523	400	484	513	438
14	..	..	..	..	..	..	..	..	..	..	..	..	..	—	459	427	482	360
15	..	..	..	..	..	..	..	..	..	..	..	..	..	..	—	731	735	702
16	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	—	641	622
17	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	—	519
18	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	—

(The decimal point is omitted from each correlation coefficient.)

TABLE II.—*Showing Product-moment Correlations for* 16 *Persons, for a Population of* 176 *Personality Traits.*

INTROVERTIVE.

	Type E (Feeling).				Type F (Sensory).				Type G (Intuitive).				Type H (Thinking).			
Persons	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46
31	—	645	607	592	401	413	442	362	125	207	305	196	143	101	122	109
32	..	—	586	516	323	342	309	303	212	134	271	233	105	015	160	217
33	..	..	—	490	339	386	400	415	204	149	198	212	022	114	155	122
34	..	..	..	—	219	203	270	277	206	218	292	244	077	028	099	195
35	..	..	..	..	—	605	593	541	307	235	298	251	151	298	—003	166
36	..	..	..	..	..	—	502	572	324	201	255	303	050	172	113	045
37	..	..	..	..	..	..	—	490	361	226	338	219	107	133	—019	013
38	..	..	..	..	..	..	..	—	241	403	222	205	122	023	014	105
39	..	..	..	..	..	..	..	..	—	517	445	423	310	203	371	208
40	..	..	..	..	..	..	..	..	..	—	421	370	493	313	283	275
41	..	..	..	..	..	..	..	..	..	..		298	388	234	302	211
42	..	..	..	..	..	..	..	..	..	..	..	—	304	266	256	293
43	..	..	..	..	..	..	..	..	..	..	..	..	—	655	593	492
44	..	..	..	..	..	..	..	..	..	..	..	..	..	—	485	418
45	..	..	..	..	..	..	..	..	..	..	..	..	..	..	—	386
46	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	—

(The decimal point is omitted from each correlation coefficient.)

permissive only; the same absence of significant residuals is consistent with many other factor hypotheses.

The four groups in each of Tables I and II are types according to the above definition. The *t*-factor saturations for each group, calculated from (5) above, are shown in Table III. These give insignificant residuals; for example, from Table I, r_{12} is 0·703; Table III gives the *t*-saturations of persons 1 and 2 as 0·883 and 0·778 respectively. Thus,

$$\begin{aligned} r_{12.t} &= r_{12} - r_{1t} \cdot r_{2t} \\ &= 0{\cdot}703 - (0{\cdot}883 \times 0{\cdot}778) \\ &= 0{\cdot}016. \end{aligned}$$

The P.E. of this residual is 0·026, so that it is not a significant difference. This applies also to all residual intercorrelations between persons of one type.

TABLE III.—*Showing Factor-saturations (Oblique) for Types A to H. Persons of the one type only are used in calculating the saturations of persons of that type.*

Persons.	Extravertive. Factor-saturation. (Oblique factors.)				Persons.	Introvertive. Factor-saturation. (Oblique factors.)			
	Type A.	Type B.	Type C.	Type D.		Type E.	Type F.	Type G.	Type H
1	883				31	844			
2	778				32	775			
3	775				33	732			
4	745				34	679			
5	714				35		804		
6	..	899			36	..	760		
7	..	853			37	..	697		
8	..	854			38	..	709		
9	..	757			39	..	..	765	
10	..	649			40	..	..	695	
11	..	..	765		41	..	..	583	
12	..	..	785		42	..	..	533	
13	..	..	706		43	..	..	..	881
14	..	..	770		44	..	..	..	735
15	..	..	..	938	45	..	..	..	671
16	..	..	..	822	46	..	..	..	567
17	..	..	..	759					
18	..	..	..	730					

(The decimal point is omitted in each saturation coefficient. The saturation for person 1 is 0·883.)

https://doi.org/10.1192/bjp.85.355.185 Published online by Cambridge University Press

Attention must be drawn to two corollaries. One is that types as defined above may correlate one with another. It can only be a matter of *fact* whether a " pure " type exists, i.e., " pure " in the sense that it has no correlation with other types. Persons in group A are of one type, and group B are another, but the persons of the one type correlate positively with those of the other. The other corollary is that the approximation of other persons (P_a . . . P_n) to any type (X) other than their own can be calculated in terms of persons of the type (X). This is done by adding the persons (P_a . . . P_n), one at a time, to the correlation matrix for the persons of type X, and thereafter calculating the t_x-saturation of each.

Thus, by inspection, or by use of prior analysis into additive factors, the correlations can be grouped into clusters, and in so far as each cluster satisfies the theorem of two factors it may be held to constitute a type. A minimum of four persons is sufficient to define a type ; any significant residuals confined to only one pair amongst a considerable number of persons would be disregarded in any first mapping out of the persons into types, although any such " specific " residuals may point to another type, embracing a small number of individuals.

Representational and Fractional Factors.

In rendering a factor account of Tables such as I and II it is essential to distinguish between two different kinds of factor analysis. One, just illustrated, merely seeks to sort out existing types and to represent them by factors (usually oblique, i.e., correlated with one another) ; the other seeks to analyse the relations between such types. Analysis of this latter kind is in terms of orthogonal factors, and hitherto factor-analysis has attended almost exclusively to this slicing up of variables into fractional factors which are additive and uncorrelated with each other. Thus Prof. Burt, contemplating Table I, would agree that the groups A to D might be regarded " empirically " as four types (Burt, 1938) but he would add that a more " rational " procedure would be to subject the table to fractional analysis, and to identify the orthogonal factors with " types ". Such " types ", however, are methodologically of the same nature as underlying tendencies, and they are not overt, lived, personality *types*.

A typical fractional analysis into additive factors gives results of the kind shown in Table IV, where Table I is subjected to analysis. The factors are orthogonal, and substantially similar results would issue from a Burt (1938), Spearman (1927), Thurstone (1935), or other factor analysis. Analysis of this fractional kind might offer information about a type, but in no way represents any such type itself. Types as I have defined them are existing, unanalysed, personalities—they may be compared to a Mae West, with just such hair, features, figure, attitudes, etc., of a total personality. But analysis into

fractional factors is like typification in terms of blond hair, or eyes, or other parts of such whole personalities.

TABLE IV.—*Showing Factor-saturations (Orthogonal) for a Fractional Analysis of Table I. This analysis might be made in many ways, by Burt, Holzinger, Thurstone, or other methods, with very similar results.*

Persons.	Extravertive. Factor-saturation. (Orthogonal factors.)			
	Factor I.	Factor II.	Factor III.	Factor IV.
1	247	845	..	..
2	270	732	..	..
3	067	794	..	..
4	263	699	..	..
5	212	681	..	..
6	405	371	696	..
7	360	366	668	..
8	399	273	720	..
9	414	292	568	..
10	403	328	421	..
11	502	114	218	534
12	576	075	245	476
13	564	083	111	410
14	531	059	044	505
15	938	..	..	
16	822	..	..	
17	759	..	..	
18	730	..	..	

CONCLUSION.

Typology of the above kind depends upon the size of the population of traits employed. Only the two arch-types, introvert-extravert, would be distinguishable if a sample of 20 traits is used; but for the 176 traits here considered a finer differentiation is possible, into sensory, intuitive, feeling and thinking sub-types. A still larger population of traits would give rise to a still finer definition of sub-types. Jung says somewhere that there are possibly thousands of types. The above system of factor representation certainly could envisage as many, but they would branch from the arch-types like members in a genealogical table. The larger the population of traits, the longer and more ramified can be the family tree.

The traits in *Q*-technique are purely statistically ordered with respect to a personality, but the definition of a type involves the use of a mathematical

theorem. This theorem, however, is used only for demonstrating a type, and not at all for " explaining " it. It seems to me to be important to distinguish between mere demonstration or isolation of types, and their explanation. Factorists in the past have gone ahead too quickly to dissect and explain their specimens long before they have caught them. *Q*-technique calls for the specimens to be caught first. It can then perhaps be seen more clearly than hitherto what the analysis into fractional factors amounts to, and how little such analysis may help one to explain anything. For it is open to question whether fractional analysis into a few major factors, each presumed to indicate an inner fundamental tendency, offers any help in explaining a personality. In the above paper I have gone to the other extreme, admittedly, to offer instead a statistical explanation of it. But this, based as it is on the complexity of human relations, is not inadequate ; it provides a basis for quantification of traits independently of individual differences ; and the data with which it operates are those of tangible whole personalities, and not of analytical parts of them. It is submitted that this statistical description does reasonable justice to Jungian typology as far as methodological matters are concerned. It can contemplate innumerable types ; these types are " limited ", and usually correlated ; but if the facts are of this nature, then why should we vainly search for " pure ", uncorrelated types ? It does not seek to explain a type in terms of a simple one-to-one relationship between trait and underlying tendency, but sees a vastly complex connection between them.

Previous work on introversion-extraversion has had a different standpoint. Ever since Stern and Thorndike (see Burt, 1938*a*) refused to countenance " limited " types, psychologists have searched for underlying tendencies bearing a simple one-to-one relation to observed reactions. This has led them far astray. For example, empirical regard showed them that certain types existed ; and no one ever supposed for a moment that any such was " pure ". But instead of distinguishing these types, bringing them into focus for further regard, psychologists have searched for their explanation by looking for fundamental tendencies. So indeed have they conducted many post-mortems on imaginary bodies.

In conclusion two details deserve mention. On methodological grounds it is important to realize that out of a thousand persons only five might conform to a type ; all the others might be uncorrelated. Possibilities of this particular kind cannot be contemplated at all in *r*-technique, where the general result for *all* persons governs the factor issues and the psychological explanations. Yet it might be just these five persons who are most significant for psychology.

The other detail relates to the matter mentioned on p. 186 ; two persons might be a type, but have different traits dominant in their personalities. The above technique takes due account of this ; for two persons may correlate only 0·20, and yet be of one and the same type. The small correlation is proof that the traits are of very divergent significance in the two personalities.

Appendix.

From Jung's book (1923) I made a list of as many traits and personality descriptions as I could without making a very exhaustive search for them. From this list, some 500 in all, a random selection of 176 was drawn, and this sample has been used in the example given in the above paper. Each of the 176 traits or descriptions was written on a card (playing-card size) and numbered. Card No. 16, for example, had on it the following :

" Satisfaction of simple elementary body requirements (cleanliness, etc.) not given due consideration."

No. 83 reads :

" highly communicative ",

No. 85 reads :

" fits into existing conditions with relative ease ".

All 176 were of this nature, some brief, and some amplified considerably. According to the context into which Jung had placed these traits, the sample of 176 consisted of the following :

Presumed type :		Number of traits of this class.
1. General extravertive	(E.)	25
2. Unconscious ,,		9
3. Thinking extravertive	(T.E.)	27
4. Feeling ,,	(F.E.)	15
5. Sensory ,,	(S.E.)	13
6. Intuitive ,,	(U.E.)	12
7. General introvertive	(I.)	6
8. Thinking ,,	(T.I.)	24
9. Feeling ,,	(F.I.)	23
10. Sensory ,,	(S.I.)	8
11. Intuitive ,,	(U.I.)	14
Total		176

Of the 176 traits, 101 are thus considered by Jung to be extravertive reactions, and 75 are introvertive.

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