

P-TECHNIQUE DEMONSTRATED IN DETERMINING PSYCHO- PHYSIOLOGICAL SOURCE TRAITS IN A NORMAL INDIVIDUAL

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P-technique, a method employing intra-individual correlation, is tried out for the first time. As part of the general design it uses some variables the same as those in a coordinated *R*-technique study and a second, parallel *P*-technique study with a clinical case. Definite factors are obtained among the psychological and physiological variables, which can be mutually matched. One is a fatigue factor, but the rest are general personality factors readily identifiable with those obtained in past *R*-technique researches.

I. *Aims and Prerequisites of P-Technique*

In 1943 it was suggested by Cattell (4) that functionally unitary personality traits, especially of dynamic modality, might be discovered by "temporal sequence studies," notably by employing a form of intra-individual correlation. Further consideration of this technique in the fuller perspective of the covariation chart (5) revealed it to have the promise of a systematic new approach, additional to, and perhaps as important as, the familiar *R*-technique, or its successor, *Q*-technique (3, 16).^{*} It seemed appropriate, therefore, to call this intra-individual "correlation of occasions" *P*-technique, homologously with the older methods (7).

The general theory and research prospects in regard to *P*-technique have been set out in earlier publications (4, 7). Essentially it is a method for applying experimental measurement with co-variational analysis to the single case. This means that one person must be measured on a collection of tests on a series of occasions. The analysis is then made on coefficients obtained from the correlations of traits in which the unit of entry is the day (or hour) of observation. The correlations can then be examined and analyzed to yield information either about *surface traits* (correlation clusters) alone, or, with more technical finish, about *source traits* (correctly rotated

^{*}What is set out in references (3) and (16) may be briefly summarized by saying that in *R*-technique we correlated *test variables* with regard to a series of persons; in *Q*-technique we correlate *persons* with regard to a series of tests. In *P*-technique we again correlate test variables, but with regard to a series of occasions and within a single person. Practically all factor analyses yet published have been in terms of *R*-technique and the remainder in *Q*-technique.

factors). The functional unities thus revealed will be unique traits. Unique surface or source traits are of two kinds: (1) *intrinsic unique traits*, unique because they involve a dimension (quality) not found in any other individual, e.g., a sixth finger, and (2) *relative unique traits* (if the language specialist will forgive the juxtaposition) in which the unique trait has a pattern approximating a common trait. *P*-technique reveals relative unique traits. There is no need of a method to reveal intrinsic unique traits, which are in any case too rare for consideration.*

As indicated in the opening sentence, *P*-technique has particular promise in dynamic and clinical psychology, where it can, at least in principle, fully cope with those problems of discovering unique dynamic structure which some psychologists have claimed to lie beyond experimental and statistical approach. What remain to be cleared up, beyond these theoretical principles, are questions of the kind listed below, which require practical attempts with *P*-technique in research situations. The present pioneer study, and another directed specifically to a clinical case (10), have the purpose of (1) illustrating the method and (2) throwing light on personality structure, particularly with regard to the following questions:

(1) Does the relative unique trait approximate to the common trait in the same field? A factor analysis of the same, identical variables by *R*-technique, on a large group of people, is now in progress, so that factors may be compared with those already published here. An *R*-technique study of *approximately* similar variables already exists (6).

(2) How great is the scatter of relative unique traits about the central form, if the latter corresponds to the common trait? A factor analysis is also in progress on a second individual (10) chosen to be very different from the present one, and doubtless further instances will multiply to answer this question fully.

(3) Is *P*-technique more efficacious, as theory suggests, in yielding the pattern of dynamic traits than of other modalities? The variety of variables possible in a small study may or may not permit an answer to this.

* Actually there appear to be *three* senses in which uniqueness has been claimed for personality measurements. It would greatly aid clarity if the debaters would indicate which sense is intended. They are: (1) uniqueness of individual personality as a unique combination (pattern) of *common* traits. This has been pointed out, in reply to Allport's contention that factors cannot do justice to uniqueness, by Wolfe and others (7); (2) uniqueness of the form (loading pattern) of the trait by which the individual is to be measured. This may be due to either (a) intrinsic uniqueness arising from an entirely new dimension in the individual or, (b) relative uniqueness, as a divergence of the trait from the common pattern, as indicated above.

Since the first theoretical presentation (4) and discussion (5, 7) of *P*-technique there has been no experiment which could be taken as an illustration of its working except possibly that of Baldwin (2) which was apparently conceived in a different theoretical framework. Prior to factor analysis (or without its employment) there have, however, been quite a number of experiments collecting measurements on various functions on a single individual from day to day, notably that of Dodge (12). It is possible that some of the data reported in these studies could be analyzed in the present more complex frame of reference to answer the newer questions propounded above. Baldwin's data do not immediately throw light on these questions because of the differences between his approach and that required by *P*-technique. In the first place his variables have not been chosen to constitute a complete sampling of the personality sphere, such as might encompass the principal personality factors found by *R*-technique, and, in the second place, his factors are not finally rotated, regardless of orthogonality, for simple structure. These methodological differences, in a study excellent within its own framework, prevent any fruitful comparisons of our results or any attempt to obtain confirmation from his results of the well-known *C*, *E*, and *F* personality factors (to which his findings have some faint resemblance) found in *R*-technique.*

Some theoretical considerations of a narrowly statistical nature remain to be considered in developing this new method, but it would be inappropriate to debate these in any detail until the basic questions have been answered. The latter concern whether the correlations obtained in this way transcend chance error, whether they yield factors having psychological meaning and interest, and whether the factors are of the same general nature as the *R*-technique personality factors. Some statistical conditions scarcely need discussion; for example, in using the product-moment formula the measurements must have the same closeness to a normal distribution as is required for *R*-technique.

The principal new problem concerns whether systematic trends in the measurements as they are made from day to day—trends running in one direction from beginning to end, such as might be associated with learning, maturation, or seasonal effect—should first be partialled out as “extraneous” to personality study. At least in an initial study of this kind the writer is quite opposed to partialling out

* It is perhaps of historical interest that Baldwin appears not to have viewed his experiment as an example of *P*-technique, cognate with the *R*- and *Q*-techniques. He regards his procedure, mistakenly in the writer's opinion, as a statistical derivative of an earlier approach studying frequency of association of responses in a single individual (1). His contribution to personality study in the latter is a completely novel method, *sui generis*. To conceive correlation within the single individual in this frame of reference is to miss the wider scope and flexibility of *P*-technique.

trends. It is better to factorize the untouched matrix and deal with trend factors as such if they appear. Any factor showing a high loading with a measure of sequential order of experiments *may* be a learning or maturation factor only. On the other hand it may be a true personality factor in which, through circumstances, there has been a continuous development during the period of experiment. For example, the *C* factor of Integration vs Neurosis might show such a trend during a course of psychotherapy.

To anticipate momentarily our findings, let it be said that we found no such global trend factor. On the other hand, we did find a factor highly loaded with the hour of the day at which experiments were carried out. This proved to be a fatigue factor, readily distinguishable from personality factors by its negligible loading in any trait permanently in personality.

In conclusion the reader should be reminded that the full evaluation of the present method can be gained only by comparison of the present results with those of two other researches, one in *R*-technique (11), one in *P*-technique with an "abnormal," clinical case (10), which were planned as part of a total study on the new method. These studies have, however, been carried out (and published) independently in order that the findings as such may not be mutually influenced. They are independently founded pillars, which may or may not prove suitable to support the hypothetical general conclusion.

II. Description of the Experiment

a. *Subject and Setting*.—The subject was a "normal" adult, not deviating noticeably from the average except in intelligence. She was a 29-year-old woman, formerly a university instructor, engaged in domestic duties during the time of this experiment.

Each day for 9 weeks (55 days, owing to week-end interruptions), running from the 22nd of April to the 19th of June, 1946, the subject was (1) measured on the same batch of test variables, (2) rated by close observers on personal behavior, and (3) self-rated on a personality questionnaire. The sessions were held at times scattered as evenly as possible over the day from 8 A.M. to 10 P.M., in order to establish the diurnal pattern of fatigue.

b. Description of Variables.—

(1) *Objective tests*.—The choice of objective tests was determined by (a) the need to coincide with the *R*-technique study, in which tests most promising as measures of personality factors were selected; (b) the requirement that the same form of test could be re-administered again and again. This eliminated some of the more

interesting tests from (a).

1. *Salivary pH* (2).^{*}—Measured, *positively for alkalinity*, by a standard pH meter.

2. *Disposition Rigidity or Perseveration* (8).—Two sub-tests only. (a) Same sentence written with forward (normal) and with backward movement of pencil; (b) multiplication of numbers in ordinary way and multiplication in which letters stand for numbers. The sentence and the code were altered every day. Speed of the old activity was divided by speed of the novel activity, according to disposition rigidity findings (8). One minute was spent on each of four activities. The second and novel test was rejected later as not correlating with the standard motor rigidity test.

3. *Myokinesis* (4).—The work of Johnson (13) and of Mira (14) suggests that magnitude and variability of movement may relate to surgency-desurgency (*F* factor) or to emotional adjustment (*C* factor). As in Mira's technique, *S* with eyes closed drew left-handed four rows of ten lines side by side with the stroke (a) downward (b) upward (c) downward (d) upward. (a) and (b) were estimated to be one, and (c) and (d) two inches in length. The mean length of line in four rows was used here, though other indices will be tested later.

4. *Reaction time* (5).—To light in dark box: (a) ten with a warning signal two seconds before light; (b) ten with irregular warning interval of 1 to 3 seconds; mean of both.

5. *Ratio of Reaction Times* (6).—Mean time for regular warning divided by time with irregular warning.

6. *Fluency and Thematic Apperception* (7).—(a) Words in one minute completing a story indicated by an opening sentence (different each day); (b) words in two minutes in one T.A.T. picture when instructed to make a dramatic story; (c) drawings in one minute on each of two fluency cards (7).

7. *Reversible Perspective* (3).—Uncontrolled cube reversal, number of reversals in two minutes' fixation.

8. *Psychogalvanic Reflex Resistance* (not finally factorized here.) Absolute resistance 15 minutes after being connected to apparatus.

^{*} The number in parentheses refers to the number of this variable in the factor table, page 284.

9. *Psychogalvanic Reflex Deflection Frequency* (11).—Number of deflections (greater than a 5% minimum magnitude) while idly looking into dark box for three minutes.

10. *Psychogalvanic Reflex Mean Deflection* (10).—To (1) loud sound; (2) electric shock; (3) effort of learning; and (4) recalling word list: worked out as per cent loss of resistance.

11. *Psychogalvanic Reflex Upward Drift* (12).—*S* left relaxed with instruction "No more shock." Recovery of resistance, as upward drift, over 30-second interval, immediately after shock.

12. *Endurance (not factorized)*.—Position on dial at which *S* reported mounting electric shock was becoming unbearable. This *S*, on the apparatus used for the men and women in the *R*-technique study, was unfortunately in the minority which reached the "ceiling" of the shock strength without protest. Consequently we recorded instead the "cost" of this endurance in terms of P.G.R. resistance drop and subsequent rise.

13. *Suggestibility* (9).—The sway test as used by Hull, Eysenck, and others and suggested by Eysenck (13) to correlate with *C* factor (general neuroticism and emotionality): (a) inches forward minus backward when phonograph record suggests "falling forward, falling forward"; (b) inches backward minus forward with suggestion "You are beginning to fall backward," similarly for one minute.

14. *Memory Total* (14).—While attached to the P.G.R., *S* was asked to memorize as many as possible of 18 words, of which 6 were emotionally colorless (table, street) and 12 emotional (3 elation, 3 frustration-anger, 3 fear, 3 depression). One minute was allowed, permitting at least four readings. Recall was tested five minutes later, 20 seconds being allowed.

15. *Memory Ratio Emotional to Non-Emotional* (13).—Ratio of emotional to non-emotional words in 13. A new list of words was made out each day.

These tests were given in the order indicated, except 14 and 15, where memorizing occurred after 9 and recall after 10.

(2) *Behavior ratings*.—While it would be very relevant to include ratings on various dynamic interests, the necessity of confining ourselves to about a dozen variables inclined us to choose the primary personality source traits (7), by which the whole personality sphere can be covered. Some of these are probably dynamic, and in any case we also had records of dreams and daily activities which could later be analyzed into dynamic interests.

Each of ten factors (Factor *B*, Intelligence, and the doubtful *L* factor were omitted) was rated immediately before the experiment, on behavior of the preceding two hours, by the experimenter and the husband of the subject, on a graphic scale. The definitions were as given elsewhere (7). However, it is important to remember that these ratings could not be reliable assessments of the whole factor but only of specific behavior central to the factor. For example, cyclothymia was assessed mainly on "easy-going cooperativeness."

1. *Factor A*. Cyclothyme vs schizothyme. Principally easy-going cooperativeness versus obstructiveness.

2. *Factor C*. Emotional steadiness vs general emotionality and neuroticism.

3. *Factor D*. Hypersensitive, sthenic emotionality vs phlegmatic frustration tolerance. Principally excitable, attention-getting behavior.

4. *Factor E*. Dominance vs submissiveness.

5. *Factor F*. Surgency vs. desurgency. Principally cheerfulness, placidity, talkativeness vs worried, depressed.

6. *Factor G*. Positive character vs immature dependence. Principally perseverance, persistence, and will qualities.

7. *Factor H*. Adventurous cyclothymia vs withdrawn schizothymia. Principally friendly, outgoing behavior vs shyness, withdrawal.

8. *Factor I*. Sensitive, anxious, imaginative emotionality vs rigid, tough poise. Principally as jumpiness and over-reaction socially vs poise.

9. *Factor J*. Vigorous, determined character vs neurasthenia.

10. *Factor K*. Intellectual, cultured mind vs boorishness. Principally rated as keenness of intellectual interests and analytical vigor of mind on the day in question.

(3) *Self-Ratings*.—The principal factors discovered in questionnaires, by Guilford, Vernon, Reyburn, Taylor, and others have been summarized elsewhere (7) by Cattell and equated, on the basis of meaning and the meagre empirical evidence yet available, to the principal external behavior factors. As an inquiry on the soundness of this matching, each of the behavior factors used in the study was represented also by one of these questionnaire factors, the two highest-loaded questionnaire items being employed for this purpose. The ratings of the two observers and the self-ratings by the subject through the questionnaire items were, however, thrown together, as indicated below, only when all three intercorrelations showed adequate reliability. This occurred in all but two of the factors. Two questionnaire factors represent factors not known in be-

havior ratings. The subject answered all these questions at the beginning of each session, not by "Yes" or "No," but by a mark on a graphic scale.

It was planned, wherever possible, to pool the inner and outer (behavior-rating and self-rating, questionnaire) estimates of each factor (giving equal weight to each), in order to begin the factor analysis with fewer and more reliable variables. The pooling was carried out, however, only when all three correlations (between the two raters and the self-rater) were positive and significant. In all cases the correlations were positive and rather low, but no lower than might be expected from an intrinsically very valid measure based on only a two-item questionnaire. The highest was .90, the median .43, the lowest .05. The lowest r 's were not between the observers but between the self-rater and the observer, and might be due to the inner and outer factors not being perfectly matched.*

III. *Analysis of Objective Test Patterns*

In any factor analysis designed to give perspective on over-all personality patterns—an important objective in a first *P*-technique study—it is desirable (a) to have the whole personality sphere represented and (b) not to have some variable representing, alone, a whole factor while other factors are represented by many variables, for in this way first- and second-order factors may be confused. The first is assured by basing our approach on previous factorization of the personality sphere. To meet the second condition, and also for economy of factorization labor, it was decided to factorize the objective tests first. The factors from the tests would then be factorized with the rating factors in a single matrix, to discover possible identities.

The objective test factors, after rotation for simple structure, are set out in Table 2 and the ensuing description.

One or two variables were omitted from the final factorization, notably the absolute P.G.R. resistance, because it seemed affected by sweating from hot weather for the whole of one week, and the memorizing, because the subject explained afterwards that she had em-

* The unsatisfactory variables were (1) *A*, in which the behavior ratings correlated only .17 and .18 with the questionnaire, though .66 with each other. We split this into A_1 , self-rating and A_2 , behavior rating. (2) *I* factor, all low but retained as a unity. (3) *D*. Sthenic-emotionality, similar. (4) *K* factor, like *A*, but here only the observers' rating was retained. (4). The two questions in QPIX (see 7) correlated only .07. Only that on daydreaming was retained, because the subject said she had no confidence in estimates of the goodness of her memory. It is interesting that the internal validities here were higher for those factors (notably *G*, in which the r 's were .89, .51, .90) where definition has been good and variance large in *R*-technique studies, than for those, notably *D* & *K*, which have been difficult to stabilize in *R*-technique (7).

ployed three different mnemonics at different times. The correlations both for memorizing and for ratio of emotional to non-emotional words recalled were, however, so consistent with respect to the factor pattern which appeared later that we discounted the subject's impressions and included it (by a secondary calculation from its correlations with highly loaded items in each factor. These were very consistent, but the loadings for these two items are naturally approximate).

Factor I. Emotional Abundance vs Emotional Dearth. — This loads high sway suggestibility and high P.G.R. deflection decidedly; and also, less highly, ratio of emotional to non-emotional recall, and upward drift on P.G.R. and frequency of deflections. It has no relation to time of day or sequence of experiments. Through these runs an emotional responsiveness to environment which might almost be called a dynamic vigor or readiness, were it not that sway suggestibility has been connected in the past with the more neurotic forms of emotionality.

Factor II. Physiological Ease vs Emergency Alertness.—Loads slow reaction time, salivary alkalinity, slow reversible perspective and, less clearly, poor memorizing, high ratio emotional to unemotional recall, low rigidity, and high ratio of regular to irregular warned reaction time. These variables are consistently and appreciably all negatively related to sequence of experiments, i.e., to practice.

Factor III. Fatigue vs Energy Reserve. — Loads time of day, quickness of reversible perspective, frequency of P.G.R. deflection, magnitude upward resistance drift during relaxation, and ratio of warned to unwarned reaction time. Except for the slightness of perseveration-rigidity loading (which, however, reaches significance in some rotations) these tests comprise known tests of fatigue and the factor is clearly one of diurnal fatigue.

Factor IV.—Uncontrol vs Inhibition. This loads Fluency, Perseveration-Rigidity, large movements in myokinesis and, less definitely, good memorizing, sway suggestibility, and P.G.R. Deflection. This factor is correlated positively with lateness of experiment sequence, but less so than II. Since rigidity (9), fluency (8) and sway suggestibility (13) have all independently been regarded as expressions of lack of integration and will (while large careless movements have the same character) it seems that this is definitely some kind of lack of inhibition, with greater spontaneity and carelessness.

The factorization which yielded these factors was intrinsically very satisfactory, first in that both McNemar's and Tucker's criteria showed definitely four factors, second in that the simple structure

was indubitable and clear-cut, and third in that simple structure, attained with unknown, numerically indexed variables, has led to certain meaningful factors. For example, time of day is central in III and is entirely absent from other factors, reaction time is wholly in II, Factor III is clearly diurnal fatigue, and so on. The obliquities of Factors I and IV and the novelty of other factors can therefore be accepted with confidence.

IV. The Principal Psycho-Physiological Source Traits in the Given Individual

The individual's level for each of the above factors on each occasion was worked out by adding the standard scores on the two or three highest variables in each factor.* These "objective test factors," as we shall call them, were next intercorrelated in a single matrix with the rated and self-rated primary personality factors. The general justification of this procedure is plain—we wished (1) to "place" the test factors in terms of known primary personality factors and (2) to begin to express and define the personality factors by definite objective measurements within the rough outlines of ratings. But the factorial problems which arise here need brief discussion.

The representation of the fourteen test variables by four factors in the final matrix is, of course, dictated largely by economy. If a test factor proves to be identical with a behavior factor, this will be revealed with reasonable certainty by the analysis. If, on the other hand, it belongs to a different universe or a different order, this also will be revealed as well by our present procedure as by lumping all variables together from the beginning.

An element of doubt arises only in so far as we are in doubt whether the factorization of the primary personality factors will yield primary or second-order personality factors. If our ratings of each factor were indeed absolutely pure measures of each factor, only second-order factors would emerge. To decide whether the test factors correspond to first- or second-order personality factors we should need only to observe whether (a) the direct correlations in the present matrix between test and rating factors or (b) loadings of the test factors in second-order factors, when corrected for attenuation, approximate unity. But our ratings are *not* pure measures of each primary factor and are presumably contaminated in various degrees with

* Factor I from suggestibility, P.G.R. deflection, and half P.G.R. rise.

Factor II from salivary alkalinity and slowness reaction time.

Factor III from time of day, speed reversible perspective, and half of reaction time ratio, P.G.R. deflection, and P.G.R. rise.

Factor IV from variability of myokinesis, magnitude of fluency, and rigidity.

other factors. Consequently it seems most likely that the factorization of the present personality factor matrix will actually yield first-order factors, each being "pointed" by high loading in the rated factor intended to represent it, but also involved to some extent in other "factor" ratings. This likelihood is increased by the fact that the personality sphere represented is likely to be widened through the inclusion of test and questionnaire variables. The examination of the correlation matrix before factorization revealed no correlations between test factors and behavior factors high enough to suggest identity, nor were the significant r 's of a test factor confined to one behavior factor.

The actual factorization again yielded four factors, according to both the Tucker and the McNemar criteria. However, in this case the presumption that more factors should be involved was so great and the indications of a factor special to three variables in the residual was so strong that we decided to extract a fifth factor, slight though it was, and attempt rotation with it. Again simple structure was obtained with unusual definiteness and inevitableness (over half the variables in the hyperplane) in the case of three factors. This occurred after four rotations in each. Another 25 rotations, however, were required to achieve simple structure on the two remaining factors, 1 and 5; and then, though satisfactory, they did not sit at comfortable angles near to orthogonality as did the first three factors. Rotation with the first four factors only yielded simple structure fairly readily with two, but eighteen more rotations were necessary to get simple structure with the remainder. Three of these factors are practically indistinguishable in loading pattern from Factors *A*, *F*, and *C* above. The fourth is also clearly the same as *G* above, but absorbs greater variance. The second cyclothyme factor *H* is therefore missing. These factors do not have such good hyperplanes as in the accepted rotation; in fact, only 60% of the number in the five-factor solution.

In view of the coincidence of the number of factors obtained—4 to 5—with the number obtained in two studies (7) of second-order personality factors, the first hypothesis to consider is that in spite of the reasons stated above these factors are indeed second-order factors. A careful comparison of the present loading patterns with those of the second-order factors (7) reveals no similarity whatever in two and a very distant similarity in the rest—so distant that, in conjunction with the absence of any resemblance in their intercorrelation, we feel justified in turning away confidently to the hypothesis originally suggested: that these are first-order factors. That this latter is true is witnessed by the ease with which the present factors—listed in Table 3 below—can be matched and identified with well-known primary personality factors from *R*-technique. We have only to set aside

for a moment our previous conception of the rated variables as factors and consider them simply as behavior rated according to the given definition, in order to see the present factors as familiarly patterned primary personality factors.

Let us first describe the factors, with labels, discussing the identifications in each case. We shall take them in diminishing order of magnitude (mean contribution to variance).

Factor 4. "C" Emotionally Stable Character vs Demoralized General Emotionality. The outstanding loadings are:

C+	vs	C—	
Inhibition	vs	Uncontrol (Test factor 4) .....	.63
Steady	vs	Emotional .....	.50
Self-sufficient	vs	Not self-suf. (Self-rated) .....	.49
.....	vs	Daydreaming (Self-rated) .....	.47
Depressed (Solemn)	vs	Cheerful .....	.36

This is clearly the C factor of R-technique studies. Daydreaming as such did not figure in those variables, but it could be taken as the equivalent of "not facing life, subjective, evasive" (7). The presence of "cheerful" is rather surprising, but it evidently functions as the equivalent of "Frivolous" in the R-technique studies (7). Both are present only in very small loadings, but this confirmation throws new light on the nature of the C factor, indicating that its positive form has some sort of sobered, mature inhibition, as opposed to immature frivolous waywardness.

Factor 5. "H" Adventurous Cyclothymia vs Withdrawn Schizothymia. Loadings in:

H+	vs	H—	
Friendly, interested in people	vs	Withdrawn, cautious, shy .....	.74
Emotional abundance	vs	Emot. dearth (Test factor 1) .....	.44
Cooperative, easy-going	vs	Obstructive .....	.37
Self-confident, dominant	vs	Submissive .....	.36
Sthenic emotionality	vs	Frustration tolerance .....	.23

It is interesting to note that two factors in the cyclothyme-schizothyme area are found here as in R-technique, but that there is no difficulty in distinguishing between them in the sense of the two factors of the earlier study. Here, as there, the second factor's schizothyme pole is distinguished by withdrawal ("shy" here; "aloof" in the original, 7).. Also there is a lack of energy, adventurousness, and self-confidence. (Self-confident, dominant, sthenic here; ascendant, expressive, incontinent, opposed to retiring, quiet, narrow in the original, 7).

Factor 1. "A" Cyclothymia vs Schizothymia loads:

A+		A—		
Cooperative, easy-going	vs	Obstructive .....		.60
Friendly, interested in people	vs	Withdrawn, shy .....		.40
Daydreaming (self-rated)	vs	.....		.50
Vigorous	vs	Languid .....		.26
Jumpy, easily embarrassed	vs	Poised .....		.25

That this is the more simple cyclo-schizo pattern of the original A is shown by the emphasis on obstructiveness—indeed the variables originally chosen as straight representatives of A and H have come out as the highest loadings respectively in these factors. This factor seems to be the more general, generic one by the fact that there is little in it besides the loadings in the two original cyclo-schizo variables. That daydreaming should appear on the cyclothyme side is a little startling, but the subject explained that she rated herself not on any intensive compensatory phantasy life but on pleasant, relaxed musing which depended most on whether or not she was in a hurry! (Note also its appearance in Surgency, below). In this connection one notes that "optimistic" appears in the original cyclothyme factor patterns.

Factor 3. "G" Positive Character Integration vs Immature, Dependent Character loads:

G+		G—		
Persevering, strong-willed	vs	Quitting, fickle .....		.44
Self-sufficient	vs	Not self-sufficient .....		.42
Shy, cautious	vs	Friendly, interested in people .....		.40
Steady, stable	vs	Emotional .....		.37

That this second factor in the general realm of character is G rather than C is evidenced by persistence and self-sufficiency being high, while emotional stability, still in the pattern (as in C), is low. At first, it is a little surprising to find shyness and caution here, but in the original R-technique factor (7) "reserve" and "self-consciousness" appear at about this same level.

Factor 2. "F" Surgency vs Desurgency (or Hysteria-Dysthymia) loads:

F+		F—		
Physiological ease	vs	Emergency alertness (Test factor 2) .....		.53
Cheerful, talkative	vs	Depressed, worried .....		.37
Cooperative	vs	Obstructive .....		.34
Daydreaming	vs	.....		.32
Submissive	vs	Dominant, self-confident .....		.30
Steady emotionally	vs	Emotional .....		.30
Not self-sufficient (Sociable)	vs	Self-sufficient .....		.27

In this the slightest of factors, we have carried the listing to include items beyond the usual minimum of loading, in search of more complete definition. This factor is clearly surgency, but again day-dreaming seems a little misplaced and again "dominance" is likewise susceptible to slightly different interpretation. In the original, "co-operative" is perhaps equivalent to "responsive, genial, sociable," and "self-sufficient" (self-rating) to "set and smug," or "unsociable" (observer). In place of "dominant" (at the negative pole) we find "hostility" and in place of "submissive" the quality of being "adaptable and reasonable." In general, where these differences exist the *R*-technique studies must be accepted as giving the finer meaning, having been based on more defined variables, but one can at least match the meaning of the latter in the present coarse variables.

Additional evidence, if it were needed, of the above identifications is found in the fact that, except for the *F* factor and one specific correlation between *C* and *G*, the correlations between factors are of the same sign and general magnitude as exist among the corresponding *R*-technique factors (6). If these *r*'s are supplemented with those found among the direct estimates of factors, in the present original correlation matrix, giving, in all, 55 correlations among 11 factors, 42 of these are of the same sign as those found in *R*-technique. Twelve of the 13 dissident *r*'s arise from three factors only: *A*, *E*, and *F*. The possibility of such similarity by chance is not utterly remote, but the finding at least contributes a further independent probability in the direction of these *Q*-technique factors being the same as those of *R*-technique.

An important finding is that the pure test factors, with the exception of the first, align themselves directly with personality rating factors, so that each has zero loadings in all but one particular member of the latter. Whether these loadings in the particular factor reach the level necessary for concluding that test and rating factor are one and the same remains to be tested. Test Factor 2 emerges as the *highest* item in general personality Factor 2 and Test Factor 4 as the *highest* in the general personality Factor 4. (That they have the same numbers is accidental). The actual loadings, having regard to the reliabilities of our estimates of the test factors by simple addition of "sub-test" scores, are consistent with complete identification of Test Factors 2 and 4 with the corresponding over-all rating factors.

Test factor 3—general diurnal fatigue—does not correlate at all with Factors 1 through 4, are scarcely significantly with 5. That this one test factor should be quite unrelated to personality makes good sense when we realize that it is merely the daily repetitive cycle of fatigue. Test Factor 1 is unique in spreading over four factors,

though highest in that with which we should expect its nature (Emotional responsiveness) to make it cognate. Exploration of the possibility that this test factor is some more basic second-order factor reveals only a slight suggestive resemblance of pattern to second-order factor SH (7), but nothing convincing. The agreement of the meaning, and even of the label, of each of the Test Factors 1, 2, and 4 (assigned to them at a stage of the research long preceding the final factorization) with the behavioral meaning of the personality factors with which they identify, is strikingly good.

What requires explanation, in view of the very definite identification of these five *P*-technique with *R*-technique factors, is the absence of some six commonly found factors in *R*-technique. Factor *B*, general ability, is obviously absent because we included no intelligence-demanding tests. Dominance "*E*" is present only as a specific, in the rating variable set to estimate it, because Dominance is quite a narrow factor affecting only social aspects of personality (7). *D*, sthenic emotionality, has always been an elusive factor, insufficiently established by recent work even in *R*-technique. *J* and *K* are very slight factors, requiring populations of two or three hundred cases for their definition. Consequently we should not expect them here to acquire variance in anything but the variable specifically set to measure each. The only absentee for which no adequate cause is obvious is the Factor *I*, Anxious, imaginative emotionality vs Tough poise. In relation to the general population our subject is extreme in *I* and in *B*, but otherwise average. Possibly there is some connection.

The rather large correlation of *A* and *F* (positive) and of *G* and *H* (negative) may be peculiar to this subject. The exact correlation among factors in one subject promises a new source of personality uniqueness and one which may be of considerable diagnostic value. The first correlation might be interpreted, in view of our general observation of this subject, to mean that when she is in a cyclothyme, responsive adjustment-state she tends to shift toward the cheerful rather than the depressive group of emotions, at least in this life situation. The second may be a form of dynamic equivalence: that when more than average energy is available it shifts either into the carefree, adventurous sociability of *H* or into a heightening of persistent, serious application of *G*, so that they become inversely related. These and other more speculative hypothetical questions of the relation of physiological to personality factors will be taken up in a later paper, in which the day-to-day changes in these five factor measurements will be related to daily happenings, records of dreams, and clinical-type observations. Any fuller interpretation will be profitable, however, only when these findings can be aligned with those of the second

P-technique study and the *R*-technique study with identical tests, which form parallel studies in a single research plan.

V. Summary

(1) Day-to-day variations in personality traits are large enough to yield, with our present accuracy of measurement and behavior rating, significant correlations and definite factors, by *P*-technique.

(2) These factors give clear-cut simple structure and are then easily recognizable as well-known primary personality factors, as obtained by *R*-technique. The correlations *among* them tend to resemble, but do not so exactly match, those found in *R*-technique.

(3) Not all *R*-technique factors appear. However, it is interesting to find that the splitting of the cyclothyme-schizothyme "general syndrome" into two distinct factors *A* and *H*, and of general character integration into two distinct factors *C* and *G*, as indicated in Cattell's *R*-technique study, is born out here in *P*-technique. In *A* the schizothyme pattern emphasizes hostility and tension, in *H* withdrawal and inhibition. In *C* sober emotional maturity (as opposed to general emotionality) is emphasized, in *G* perseverance and vigor (as opposed to emotional dependence). The fifth factor is Surgency-Deurgency, *F*.

(4) Four clear-cut factors appear in the physiological and psychological tests. Two appear to be identical with personality factors *F* and *C*. Another is general diurnal fatigue. The last, (*I* in Table 2) Emotional abundance vs Emotional dearth, loading psychogalvanic response, ataxic sway under suggestion and P.G.R. drift and frequency, is principally associated with *H* (Adventurous cyclothymia vs Withdrawn schizothymia) but possibly shows a little relation also with *C*(+) and *G*(-). Factor *A* shows no relation to any physiological factor we measured, agreeing with an earlier tentative hypothesis that *A* is the environmental and *H* the constitutional factor in schizothymia.

(5) These results suggest new objective test batteries for five primary personality factors and help clarify the functional nature of these factors. However, these developments, as well as the answering of further theoretical issues in factorial personality analysis methods and the relating of the present factor variations to daily events, await the correlating of the present results with those of the two coordinated researches—one on *R*-technique, one demonstrating the value of *P*-technique for clinical practice.

TABLE 1
Factors in Self-Rating

Personality Factor Scored and Direction of Scoring	Questions Answered by Subject on Graphic Rating Scale
<i>A. Cyclothymia-Schizothymia</i>	
("Yes" in negative direction)	1. Do you feel relatively shy and self-conscious today, so that you have tended to keep in the background on social occasions?
("Yes" negative)	2. Have you felt today that your mind has tended to move slowly so that you keep to one track in conversation instead of jumping about?
<i>D. Sthenic emotionality</i>	
("Yes" positive)	3. Have you felt today rather easily excited and rattled in difficult situations?
("Yes" positive)	4. Do you feel unduly sensitive so that your feelings are easily hurt by remarks?
<i>F. Surgency-Desurgency</i>	
("Yes" negative)	5. Have you felt depressed and miserable for no good reason or have you felt above average in spirits
("Yes" negative)	6. Have you felt unduly worried and tense today or not?
<i>C. Stable character vs General emotionality</i>	
("Yes" negative)	7. Have you suffered today from periods of loneliness?
("Wrong" negative)	8. Is this a day on which everything seems to have gone wrong or on which things go well?
<i>QPX. Obsessional inflexible vs Asthenic QPV</i>	
See (7). Asthenic answer	9. Have you been daydreaming much today?
Negative in both	10. Has your memory been good today or poor and uncontrolled?
<i>E. Dominance-Submission</i>	
("Yes" positive)	11. Have you felt today generally very self-confident or lacking in confidence?
("Others" positive)	12. When things have gone wrong today, do you think it has been mainly your fault or the fault of others?

TABLE 1 (Continued)

QP. VIIIa Self-Sufficiency See (7)
 ("Yes" positive) 13. Have you felt so absorbed in your work today that you have not noticed a need for company?

G. Character integration-Dependence
 ("Above" positive) 14. Have you been above or below average in your persistence and perseverance today?
 ("Control" positive) 15. Do you feel that your emotional moods have been under very good control or not?

I. Anxious emotionality-Poise
 ("Yes" positive) 16. Have you been rather easily startled and distracted by sudden sounds today?
 ("Insomnia" positive) 17. Did you fall asleep easily last night or did you suffer some degree of insomnia?

K. Cultured mind vs Unintellectual
 ("Yes" positive) 18. Have you spent much time today in serious discussions, intellectual analysis, or not?

TABLE 2
 Rotated Factors in Objective Psychological and Physiological Measures

<i>Tests and Variables</i>	<i>Factor Loadings</i>				<i>h²*</i>
	<i>F₁</i>	<i>F₂</i>	<i>F₃</i>	<i>F₄</i>	
Time of day .....	.02	.02	.71	-.05	.53
Salivary pH (alkalinity)	-.03	.56	.07	.00	.36
Reversible perspective, rapidity	-.17	-.43	.56	.09	.56
Myokinesis, size of lines drawn	-.18	.02	.03	.50	.48
Reaction time, length of	-.03	.75	-.09	-.04	.59
Reaction time, ratio regular to irregular	-.02	.28	.34	-.01	.24
Fluency of association (T.A.T.)	-.03	-.21	-.15	.55	.44
Perseveration (D. Rigidity) .....	.02	-.35	.12	.51	.47
Ataxic sway suggestibility .....	.75	-.02	.02	.35	.58
Size P.G.R. deflection .....	.73	.22	.30	.32	.65
Frequency of P.G.R. deflection .....	.27	.03	.48	.01	.29
Upward drift P.G.R. after stress .....	.39	-.14	.40	.01	.34
	<i>Approximate Estimate Only</i>				
Ratio emotional to unemotional recall .....	.65	.40	.00	.00	
Efficiency memory-recall .....	.00	-.45	.00	.40	

Direction Cosines Among Factors

	<i>F₁</i>	<i>F₂</i>	<i>F₃</i>	<i>F₄</i>
<i>F₂</i>	.19			
<i>F₃</i>	.00	-.12		
<i>F₄</i>	.39	.06	-.26	

* Communalities expressed for original orthogonal axes.

TABLE 3
Rotated Factors in Personality Ratings and Measures

<i>Variables</i>	F_1	F_2	F_3	F_4	F_5	h^2
1 Test Factor I. Emotional abundance .....	.05	-.18	-.32	.33	.44	.33
2 Test Factor II. Physiological ease vs Emergency alertness .....	.16	.53	-.03	-.01	.06	.32
3 Test Factor III. Fatigue vs Energy .....	.02	.02	-.07	-.06	.17	.19
4 Test Factor IV. Uncontrol vs Inhibition	.12	.00	-.06	-.63	-.07	.44
5 Factor A'. Cyclo-schiz. (Inverse of self- rated shyness, slowness)	-.13	.02	.06	.24	.19	.48
6 Factor A'. Cyclo-schiz. (Cooperative-Ob- structive) .....	.60	.34	.23	-.02	.37	.69
7 Factor C. Stable emotionally vs Emo- tional	-.03	.30	.37	.50	-.01	.70
8 Factor D. Self-sufficient, frustration tolerant	-.04	-.04	.02	-.07	.23	.77
9 Factor E. Self-confident, dominant vs Submissive, mild, retiring .....	.02	-.32	-.04	-.02	.36	.62
10 Factor F. Surgent vs Desurgent cheer- ful, content vs worrying, anxious .....	.04	-.37	-.23	-.36	-.02	.60
11 Factor G. Persevering, integrated, strong- willed vs Quitting, fickle	-.14	-.04	.44	.06	-.07	.87
12 Factor H. Advent. Cyclo-schiz. (Friend- ly, interested in people vs shy, cauti- ous) .....	.40	.05	-.40	.04	.74	.78
13 Factor I. Jumpy, easily embarrassed, over-active imagination vs Poised, tough, practical .....	.25	.03	-.07	.02	.24	.11
14 Factor J. Languid, absent-minded, as- thenic vs Vigorous, orderly	-.26	-.07	-.30	-.25	-.14	.73
15 Daydreaming tendencies .....	.50	.32	.06	-.47	.02	.46
16 Factor QPVIHa. Self-sufficiency	-.19	-.27	.42	.49	-.06	.68
17 Factor K. Intellectual, analytical vs Un- interested in cultural matters	-.05	-.06	.06	.06	-.26	.47
Number of variables in hyperplane	7	9	9	9	7	
Mean variance due to factor .....	.060	.056	.058	.087	.076	

Direction Cosines Among Factors

	F_1	F_2	F_3	F_4	F_5
Factor 1. A: Cyclothymia-Schizothymia	F_1				
Factor 2. F: Surgency-Desurgency	F_2	.50			
Factor 3. G: Positive character integra- tion-Immature, Dependent	F_3	.09	.18		
Factor 4. C: Emotionally stable char- acter-Demoralized general emotionality	F_4	-.31	-.05	-.13	
Factor 5. H. Adventurous cyclothymia- Withdrawn schizothymia	F_5	.33	.00	-.60	.21

TABLE 4
Intercorrelations of Objective Tests*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Sequence no. of session	1														
Hour of day	2	23													
Salivary pH	3	-58	17												
Reversal of perspective	4	64	44	-20											
Myokinetic size	5	77	02	11	26										
Reaction time	6	-40	04	36	-37	14									
Ratio reaction times	7	20	14	14	30	04	30								
Fluency	8	17	12	23	10	38	21	04							
Perseveration	9	70	14	-22	40	45	-28	12	18						
P.G.R. sway suggestibility	10	06	04	-20	-04	-27	-14	06	09	14					
P.G.R. mean defl.	11	-04	23	18	10	-03	04	09	07	07	55				
P.G.R. no. of deflns.	12	15	34	07	15	14	-03	09	-10	07	23	35			
P.G.R. upward drift	13	04	28	-05	17	0	-12	-04	-21	08	32	35	23		
Ratio emotional recall	14	-47	-21	27	-29	-07	18	14	10	-31	63	26	39	14	
Total recall	15	30	03	-10	29	17	-10	09	20	31	16	09	12	06	10

* Decimal points have been omitted from all entries in this table.

TABLE 5
Intercorrelations of Ratings and Test Factors*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Factor 1. Emotional Responsiveness	1																
Factor 2. Relaxation	2	-11															
Factor 3. Fatigue	3	14	-19														
Factor 4. Uncontrol	4	-30	02	23													
Cyclo-Schizo (Self-rating)	5	-18	-03	-22	16												
Cyclo-Schizo Coop. vs. Obst.	6	-19	-10	-22	02	16											
Emotional Stability	7	07	09	16	-31	-50	-28										
Attention-getting, fussy	8	-15	14	-34	-10	56	33	-32									
Self-confident, dominant	9	-29	25	-16	-03	48	29	-13	58								
Cheerful, surgent	10	-16	17	03	-29	-37	-41	59	-37	-18							
Persevering, integrated	11	-01	15	-25	16	56	31	-50	69	55	-63						
Adventurous, interested	12	-38	-17	-25	-15	25	49	-07	43	57	-15	23					
Oversensitive, imaginative	13	02	-06	05	09	11	27	00	-01	10	05	-03	29				
Neurasthenic, languid	14	-05	-08	-24	-15	40	39	-28	57	52	-41	69	42	06			
Daydreaming	15	02	24	-12	21	17	-18	-22	15	11	00	30	02	-02	-07		
Self-sufficiency (self-rated)	16	-11	29	-09	28	25	28	-60	19	17	-29	39	03	-02	22	51	
Intellectual interests	17	09	-03	-23	09	41	21	-30	62	42	-26	51	44	19	42	24	15

* Decimal points have been omitted from all entries in this table.

TABLE 6
Manner of Decline of Residuals in Main Factorization (Table 2)

Arithmetic mean of correlations before 1st factor <u>extracted</u>	= .242
Arithmetic mean of residuals after 1st factor <u>extracted</u>	= .128
Arithmetic mean of residuals after 2nd factor <u>extracted</u>	= .093
Arithmetic mean of residuals after 3rd factor <u>extracted</u>	= .074
Arithmetic mean of residuals after 4th factor <u>extracted</u>	= .064
Arithmetic mean of residuals after 5th factor <u>extracted</u>	= .059

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