CYCLOTHYMIA AND SCHIZOTHYMIA AS A DIMENSION OF PERSONALITY

I. HISTORICAL REVIEW

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INTRODUCTION

If, as the writer believes, personality is the central problem and the focal point of psychology, there can be few attempts more important than to lay an adequate taxonomic foundation which alone can make possible classification and measurement in this field It was from this general point of view that two dimensions of personality were isolated by the writer (19) (1) a general factor of neuroticism, classifying people according to their emotional stability, maturity, or integration, (2) a factor of extroversion-introversion similar to that outlined by Janet (33) and Jung (34) Statistical evidence was provided in favor of this hypothesis, and experimental evidence was given to show that both dimensions could be measured with considerable reliability and validity While this work was in progress, it became increasingly apparent that some clarification would have to be found with regard to the relation of the factors isolated to the main dimensions emerging from Kretschmer's well-known investigations (38) An attempt to do so will be made in the present series of papers, but before attempting such an integration and the experimental examination of Kretschmer's theory that such an attempt would require, it will be necessary to give a detailed account of the present state of knowledge with respect to this system

The reasons why this should be so are several In the first place no accurate account of Kretschmer's system exists in the English language to the writer's knowledge Most sources give accounts referring to the English translation of the original 1921 edition of Kretschmer's book (41), in other words, the great accumulation of experimental data of the last 25 years and the many changes which the theory has undergone are completely neglected by many

writers on the subject Even those who do take into account later editions often misinterpret Kretschmer's views and fail to quote supporting evidence from the large volume of literature which has grown up around his system It is not an isolated instance, for example, to find Britt (4) criticizing Kretschmer for failing to control the age factor in his subjects, when in all the later editions of his book Kretschmer is careful to give separate tables and diagrams for the over and the under 30's, or to find Sheldon (78, 79) criticizing Kretschmer for holding a conception of "types" which in reality he does not hold at all Similarly, Tyler (87) quotes various writers as having shown that the relationship of physique to temperament within the normal range cannot be a very important source of personality differences, yet, in view of the fact that the tests used by the authors she quotes have no relation to Kretschmer's theories, it is difficult to see the relevance of their conclusions to his system To show that groups X and Y do not differ with respect to traits *a, b, c,* and *d* does not disprove the theory that they differ with respect to traits *l, m, n,* and *o* Altogether, it may be suggested that, with respect to the Kretschmerian theory, there has been a failure of scholarship in the Anglo-American countries, a certain parochialism which resembles that found among Continental writers, who tend to neglect Anglo-American contributions to their subject In view of this general position a rather detailed account of the system to be investigated must be our first task

Kretschmer's General Scheme

Kretschmer's system is a typology, but it would be very wrong to imagine that his conception of "type" is similar to that so frequently criticized in elementary textbooks In his own words (translated, like all quotations in this paper, by the writer):

> The concept of type is the most important fundamental concept of all biology Nature does not work with sharp contrasts and precise definitions, which derive from our own thought and our own need for comprehension In nature, fluid transitions are the rule, but it would not be true to say that, in this infinite sea of fluid empirical forms, nothing clear and objective could be seen, quite on the contrary In certain fields, groupings arise which we encounter again and again, when we study them objectively, we realize that we are dealing here with focal points of frequently occurring groups of characteristics, concentrations of correlated traits . . . What is essential in biology, as in clinical medicine, is not a single corre-

lation, but groups of correlations, only those lead to the innermost connections It is daily experience in the field of typology, which can be deduced quite easily from the general theory, that in dealing with groups of characteristics one obtains higher correlations than with single characteristics What we call, mathematically, focal points of statistical correlations, we call, in more descriptive prose, constitutional types The two are identical it is only the point of view which differs A true type can be recognized by the fact that it leads to ever more connections of biological importance Where there are many and ever-new correlations with fundamental biological factors, for instance, in the constitutional types dealt with here, we are dealing with focal points of the greatest importance (38)

It will be seen that the conception of type which Kretschmer has elaborated here is very similar to the one given by the writer, who regards types as "observed constellations or syndromes of traits," and traits as "observed constellations of individual action tendencies" (19) This use of type, which is not far removed from the conception discussed by Murphy and Jensen (63), appears to be free from the defects which the concept of type is often alleged to possess Given this definition we find that the particular system of correlations which Kretschmer chooses as a starting point lies in the constitutional field, i e, in the field of body types, where he contrasts, as is well known, the pyknic and the leptosomatic types, with a third one, the athletic, considered sometimes intermediate and sometimes definitely divergent from the other two In addition, he has dysplastic types and a certain proportion of unassignable doubtfuls While Kretschmer's aproach is not exactly along statistical lines, a number of factorial studies of intercorrelations between bodily dimensions, reviewed by the writer (19), have shown that essentially there is a main dichotomy corresponding closely to his pyknic-leptosomatic type, and there can, therefore, be little doubt that this first step in his typology is eminently sound, although it may be suggested that greater statistical sophistication might have enabled him to purify his concepts rather more and also to arrive at better indices of body build than those elaborated in his book

The position of the athletic type raises important points here, a consideration of which cannot be deferred Kretschmer and Enke (46) consider the athletic type as being essentially different from both the others rather than as being intermediate between them This position appears unacceptable to us In the first place,

there is no independent statistical proof, such as only factor analysis could supply in our own work we found no evidence of a factor of this kind (19) In the second place, in the large body of experimental work in which Kretschmer and his followers have tried to differentiate the three body types with respect to psychological functions, it will be found in almost every case that the athletics are intermediate between the pyknics and the leptosomatics, though somewhat closer to the latter This suggests very strongly that they are not in a separate group, but are, in truth, intermediate The attempt of Kretschmer and Enke to create a third type from the athletics often leads to rather disingenuous arguments Finding usually that leptosomatics and athletics differ very little in their test results and are opposed to the pyknics, they have to argue that the causes which lead to the test results of leptosomatics are different from those which lead to the test results of the athletics, although no evidence of any kind is given to support these *ad hoc* arguments The reader will be able to judge this point from the results quoted, and we will, wherever possible, give data for all three groups separately

If the pyknic-leptosomatic typology is not only justified but also fruitful, we should expect to find a large number of correlations of biological importance, and, indeed, the main part of this paper will be devoted to a discussion of psychological correlations as found by Kretschmer and his students However, it may be noted that there are also a large number of physiological correlations, particularly in the field of autonomic functioning and of endocrinology, which deserves at least brief mention

Hertz (26) has shown greater autonomic reactivity to adrenalin, atropine, and pylocarpin in leptosomatics than in athletics, and in athletics as compared to pyknics Hirsch (28) has shown constitutional differences with respect to blood-sugar curves, as has also Bartelheimer (1) Similarly, Kuras (51) has found differences in reaction to sympatology between different body types his results are in good agreement with Hirsch's findings Mall (58) found marked typological differences in blood-sugar determinations after injection of thyroid hormones, and Winkler (94) has shown differential effects with insulin Jahn (32) and Greving (23) have found

typological differences with respect to metabolic processes Schlegel (73) and Mall (57) have worked out the specificity of appetites for different constitutional groups The same author has shown marked differences in blood analyses between different types (57), and Schlegal (73) has found differences in chronaxy Muller (62) and Peretz (69) have described differences in capillary formation, and Catsch (6) has published differences in blood pressure at various ages between leptosomatics and pyknics, as well as correlations between different physical disorders and bodily habitus, as have also Hueck and Emmerich (30), Klein (36), Kowarschik and Wellisch (34), Tschernıng (86), Burkhardt (5), and Hohne (29) Also mentioned in this connection should be the work of Hanse (25) and Widdemann (93) on blood pressure, and of Berg (2), Wolfer (95), Luxenburger (56), and Nageli (64) Gynecological differences are noted, particularly by Frankel (21), Mathes (59), Geller (22), and Hirsch (28) Other relations between constitution and sex are found by Kronfeld (50) and Weil (91)

While we have purposely quoted only German writers, papers in English on the subject being accessible and probably familiar to readers in any case, it will be clear that even though not all these articles are of high scientific competence, and although many of them suffer from lack of statistical sophistication, yet they agree on so many points that it can hardly be gainsaid that many important physiological correlates of body types can be found An excellent introduction to the main findings is given in a recent paper by Mall (57), to which the interested reader is referred Since our main purpose in this paper is a discusson of the psychological test results, there will be no space for an adequate discussion or critique of the above findings

Having laid his foundation in terms of body build, it is well known that Kretschmer proceeds to point out that there is close affinity between the manic depressive type of insanity and pyknic body build on the one hand, and between schizophrenic disorders of all kinds and the leptosomatic (and to a smaller extent the athletic) type on the other. He also points out the particular affinity obtaining between athletic body build and epilepsy, basing his conclusions, in part, on Dubitscher work with the Rorschach Test by (9), who

found among athletics reactions very similar to those found by Rorschach among epileptics (72) Westphal (92) gives a table embodying over eight thousand cases showing these relations fairly clearly (Table I)

TABLE I

DISTRIBUTION (IN PER CENT) OF BODY TYPE FOR SCHIZOPHRENIC, MANIC-DEPRESSIVE, AND EPILEPTIC GROUPS

	Schizophrenics 5233 cases	*Manic Depressives 1361 cases*	*Epileptics 1505 cases*
Pyknic	13 7	64 6	5 5
Athletic	16 9	6 7	28 9
Leptosomatic	50 3	19.2	25 1
Dysplastic	10 5	1 1	29 5
Doubtful	8 6	8 4	11 0

The writer has reviewed the literature with respect to these somato-psychic relations elsewhere (19) and will not repeat his conclusions By and large, we may accept the main points made by Kretschmer, i e , the prevalence of leptosomatic body build among schizophrenics and of pyknic body build among manic-depressives It is known, however, that Kretschmer goes beyond the correlation of psychotic disorders and body types, he believes that schizophrenia and manic-depressive insanity are merely extremes of contrasted psychological trait syndromes, which he calls the cyclothyme and the schizothyme, respectively He holds that what is true of the extremes is also true, if to a lesser extent, of the less exaggerated, more normal members of each type As he says

> Only when this view point is pursued into the field of normal psychology will we be able to appreciate the problem of constitution in its full importance There is no jump in thus going over into normal psychology, but as we follow the threads between body build and psychological peculiarity from the psychotic, step by step, through all types of psychopathic personality and get further and further away from those great mental disturbances which form the beginning of our investigation—lo and behold—suddenly, we find ourselves among healthy people, among well known faces Here we recognize as familiar, normal features those traits which previously we had seen in caricature We find the same types of facial structure, the same stigmata of bodily constitution, and we find that behind the same exterior dwell the same psychological forces

This general theory may, perhaps, be introduced in terms of a hypothetical figure showing the distribution of the whole population in terms of a normal curve of distribution, ranging from one ex-

treme (schizophrenia) to the other (manic-depressive insanity). All persons left of the mean would be schizothymic, meaning by that merely that their personality make-up has in common certain elements which are grotesquely exaggerated in these psychotic patients, whom we label schizophrenics, whereas all those to the right of the mean would be cyclothymics, meaning by that that their personality make-up has in common certain elements which are grotesquely exaggerated in manic-depressive patients Persons who are definitely abnormal but not yet psychotic Kretschmer calls schizoid or cycloid respectively, according to the side on which they fall, whereas the large number of persons in the center of the distribution he calls syntonic, if they are on the cyclothymic side, and dystonic if they are on the schizothymic side It is possible that Kretschmer would object to the use of a normal curve to depict the relation between schizothymes and cyclothymes, but little importance can be attributed in any case to any form of distribution when the underlying metric is unknown, just as in the case of the distribution of intelligence, the normal curve must be regarded merely as a convenient device rather than an accurate representation of actuality

We believe that in all essentials such a figure brings out accurately the main points of Kretschmer's views We see, therefore, that Kretschmer is suggesting a definite dimension of personality, which we may call cyclothymia-schizothymia, but it would seem to follow from his writings that another dimension is also implied, ranging from normality to psychotic disorder and orthogonal to the first, so that his theory can best be represented in terms of two orthogonal axes, one measuring schizothymia-cyclothymia, the other normality–psychotic abnormality or "psychoticism" Indeed, if we were to follow him faithfully, we would have to add two further dimensions, namely, the diathetic and the psychasthetic scales In his view, cyclothymes vary among themselves on a scale ranging from humorous, vivacious, quick-witted, to the quiet, calm, serious—the so-called diathetic scale, whereas schizothymes vary from shy, nervous, sensitive, to dull, stupid, torpid—the so-called psychasthetic scale As, however, there is no experimental evidence in Kretschmer's work regarding these scales, and as he makes little use of them and does not define their relation to each other in any way,

we have thought it better to simplify the problem by concentrating on his major hypothesis rather than on these subsidiary ones The student of this problem, however, should keep them in mind

Experimental Investigations

Below will be reviewed a large proportion of the experiments carried out by Kretschmer, his students, and followers, in an attempt to support the general theory outlined above We shall be concerned only with the psychological aspects and more particularly with the methodological validity of these attempted proofs The experiments will be grouped in a manner similar to that adopted by Kretschmer himself Each experiment will be referred to by letter, denoting the heading under which the experiment falls, and a number, for the sake of easier reference in the discussion later It should be noted that Kretschmer himself does not apply statistical tests of significance to his data, wherever possible, this defect has been made good by the writer, and all statements of significance in this paper are the result of calculations made specially By and large, Kretschmer's attempts to prove the truth of his theory may be divided into two categories—direct and indirect proof We may quickly describe the four main experiments constituting the direct proof, the rest of this section will be devoted to his indirect proof

A Direct Evidence of Body-Mind Relationship in Normal Subjects

(1) Kretschmer (38) chose 150 normal persons, well known to him, who were clearly leptosomatic, athletic, or pyknic On assessing their psychological peculiarities he found considerable agreement between pyknic habitus and cyclothymic temperament on the one hand, and between athletic and leptosomatic habitus and schizothymic temperament on the other This experiment is not reported in sufficient detail to be evaluated, quite apart from the fact that preconceptions regarding a possible correlation between habitus and temperament would invalidate any conclusions here as much as in the later work of Sheldon (78).

(2) Van der Horst (88), in his very early work, took 17 typical nonpsychotic leptosomatics and 17 typical nonpsychotic pyknics and gave them a questionnaire containing what Kretschmer considered

typical cyclothmic and schizothymic traits He reports high concordance between leptosomatic body build and schizothymic temperament and pyknic body build and cyclothymic temperament

(3) Kibler (**35**) repeated the experiment with a slightly different questionnaire on 19 normal pyknics and 24 normal leptosomatics He also reported positive results In Table II are given the combined results of these two authors The nonchance character of the results is indicated by a $P < 01$

(4) A fourth experiment, along similar lines, is reported by Zerbe (**96**), whose results on 72 normal students are given in Table II Again, the results support Kretschmer's hypothesis, and again there is a $P < 01$

TABLE II

DISTRIBUTION (IN PER CENT) OF PYKNICS (ATHLETICS) AND LEPTOSOMATICS IN CYCLOTHYMIC, MIXED, AND SCHIZOTHYMIC GROUPS (DATA OF KIBLER AND ZERBE)

Author	*Temperamental Type*	*Pyknics*	*Athletics*	*Leptosomatics*
Zerbe	Schizothymes	5	44	88
	Cyclothymes	77	32	4
	Mixed	18	24	8
Kibler	Schizothymes	2 8		70 7
	Cyclothymes	94 4		12 2
	Mixed	2 8		17 1

These three questionnaire studies are more impressive than Kretschmer's original ratings, but, apart from the small number of cases, it is very difficult to know how much confidence to place in questionnaire studies of this type The results would, possibly, be more convincing if the correlations were not so extremely high Results of such perfection must inevitably arouse a certain amount of doubt and mistrust In any case, Kretschmer himself places relatively little importance on these findings, but is far more concerned with his indirect method of proof, to which we must now turn

This method is of great methodological interest, although, rather oddly, there appears to be no discussion of its underlying principles by non-German authorities The general principle appears to have been laid down first by Van der Horst and is exemplified in the summary he gives of his own work

> There always appeared a marked correlation between the normal leptosomatic subject and the schizophrenic patient on the one hand, and the normal

pyknic subject and the manic-depressive subject on the other This suggests a close relation between the psychological makeup of the leptosomatic and the schizophrene and a firm concordance between the psychological structure of the pyknic and the manic-depressive (89)

Put in other words, Van der Horst and Kretschmer try to show the general validity of the concept of schizothymia and cyclothymia beyond the psychotic realm by using body build as a *tertium quid*, their method of proof is to show that normal people of leptosomatic or pyknic body build react to certain psychological experiences in a manner similar to that of schizophrenes and manic-depressives, who are known to be also leptosomatic or pyknic This is an ingenious method which deserves careful consideration Some of the results from it, particularly those of Van der Horst himself (89) and of Kibler (35), are very impressive indeed Fundamentally, however, it has certain weaknesses which make it doubtful whether any definite conclusions can be derived in this way As a methodology it follows only partly the rules of the hypothetico-deductive method, as the results deduced from the hypothesis are not stated in a rigorous enough fashion to make proof or disproof possible This is particularly so in view of the fact that the authors quoted do not state their results in terms which are amenable to proper statistical treatment However, in spite of these criticisms, it should be realized that here we have a method which could be made into an extremely powerful tool by slight changes in methodology and procedure, and when it is realized that the work to be described was carried out at a time when the research genius of the rest of the world was still gazing upon the Bernreuter as a *ne plus ultra* of personality tests, it will be clear that here was a serious effort to come to grips with a problem of fundamental importance at a time when its very existence was realized by very few other workers.

We shall return to these methodological considerations later on and attempt to suggest an improved method for solving the very difficult problem which Kretschmer set himself, by means of a modification of the factorial approach Before doing that, however, we shall briefly summarize various researches falling under this general heading

B The Dissociative-Integrative Hypothesis

Kretschmer holds that the concept of dissociation *(Spaltung)* is of fundamental importance in understanding the mentality of the schizothyme, just as its opposite, integration, is important for the understanding of the cyclothyme mentality His concept of dissociation goes further than that of Warren (90) "The breaking up of a combination of any sort into its constituents" He means by it "the ability to form separate and partial groupings within a single act of consciousness, from this results the ability to dissect complex material into its constituent parts" This tendency towards dissociation characterizes the schizothyme and when exaggerated puts the *schiz* into *schizophrenia!* The absence of this ability to dissociate leads to a concrete, synthetic way of looking at the mental content which characterizes the cyclothyme and, in exaggeration, the manic-depressive

(1) An experiment carried out first by Van der Horst (88) and then repeated by Kibler (35) may be quoted as contributing to the operational definition of this concept and also as showing most clearly the methodological use of different groups in Kretschmer's work In a complex reaction time experiment the disturbing effect of various agents was measured in the case of normal pyknics, normal leptosomatics, schizophrenics, and manic-depressives It was found that the influence of distracting stimuli lengthened the reaction time of normal pyknics and of the manic-depressives much more than those of normal leptosomatics or of schizophrenics The curves of manic-depressives and normal pyknics coincide, as do the curves of normal leptosomatics and schizophrenes The greater ability of leptosomatics and schizophrenics to withstand disturbing stimuli is explained in terms of their dissociative ability, i e , concentration of one aspect of the total situation to the neglect of any other

(2) In an experiment by Enke (17) the subject has to remember the number of differently colored squares on a card which he himself is pushing at his own speed into an envelope, the theory underlying the experiment being that the schizothyme with his dissociative ability would easily be able to carry in his mind the number of different categories into which to classify these various colored squares, so that he would be quicker and more accurate in the total task.

When the experiment was carried out on normal subjects, pyknics made 32 4 errors on the average, athletics 15 3, and leptosomatics 6 7 The pyknics, on the average, took 75 3 seconds, athletics 71 4, and leptosomatics 66 6 The results thus bear out the hypothesis

(3) In an experiment by Kibler (35), colored groups of nonsense syllables are shown to the subject in a tachistoscope, under instruction to observe either the color or the letters The hypothesis underlying the experiment would require the schizothyme, with his higher abstractive ability, to be able to observe what is required and to pay no attention to other features of the stimulus, whereas the cyclothyme would remember more of what he was not asked to observe and less of what he was asked to observe Kibler found that highest dissociative ability, i e , complete failure to notice or remember what was not asked for, occurred in 20 7 per cent of leptosomatics and schizophrenics, but in only 4 5 per cent of pyknics and manic-depressives Again, the hypothesis is borne out

(4) Enke (17) presented tachistoscopic exposures of long, unfamiliar words, which were being shown ten times so as to facilitate reading of the word, which could not be completed at one exposure He found that there were two ways of getting at the meaning of the word firstly, the abstractive, analytic, dissociative method, in which the total word was built up by reading successive letters and syllables and constructing a whole from these parts and secondly, by getting a single impression and elaborating that in successive exposures, i e , a synthetic method of procedure Among his subjects he found that the ratio of dissociative over synthetic approaches was 3 3 over 5 1 for the pyknics, 5 7 over 3 0 for athletics; and 6 0 over 2 0 for leptosomatics, showing a great preponderance of the dissociative method for leptosomatics, of the synthetic, integrative method for pyknics, with athletics intermediate In view of the obviously greater appropriateness of the dissociative method in this case, it is not surprising to find that pyknics had 75 per cent failures, athletics 40 per cent, and leptosomatics 42 per cent In these experiments, differences between pyknics and the other two groups are significant at the $P < 01$ level

(5) The obverse of this advantage is shown, however, in another series of tachistoscopic experiments carried out by Van der Horst

(89) and Kibler (35) in which pyknics and manic-depressives are shown to be able to take in more letters simultaneously than leptosomatics and schizophrenics Enke (17) failed to verify these results, and, in any case, it is not clear to what extent such a finding would support the general theory Kretschmer (38) appears to think that the synthetic mode of apperception of the cyclothyme would give him the advantage in experiments of this type, but this argument is not very convincing

(6) In a rather different modality lies the ergographic work of Enke (13), who showed the effects of mental addition of 20 numbers on the regular rhythm of the ergograph There were disruptions of this regular rhythm for pyknics in 27 per cent of the cases, for athletics in 14 per cent of the cases, and for leptosomatics in 8 per cent of the cases This inability to keep two different tasks separate definitely bears out the dissociative hypothesis, as does also the fact that the correct answer to the mental addition was given by 27 per cent of the pyknics, 35 per cent of the athletics, and 50 per cent of the leptosomatics, while the time taken over the task was 48 seconds by the pyknics, 45 seconds by the athletics, and 38 seconds by the leptosomatics Results are significant at the $P < 01$ level

(7) Rather less impressive is a report by Zerbe (96), who argued that chess demands good dissociative ability and found among students that 74 per cent of leptosomatics, 53 per cent of athletics, and 33 per cent of pyknics play chess It is difficult to evaluate this finding

(8) We might also mention in this connection the findings of Dambach (7) and Schmidt (74), who find among children that cyclothymes are more easily able to divide their attention, while schizothymes are able to abstract more easily The experiments on which these findings are based will be reviewed later

(9) Enke (10), using the Rorschach Test, showed that when a comparison is made between the number of whole versus detailed answers, pyknics give 20 per cent of whole answers and leptosomatics 58 per cent This is interpreted in terms of the higher abstractive ability of the leptosomatics. The difference is significant at the $P < 01$ level

(10) An experiment by Van der Horst (89) can, perhaps, also

be classified in this connection He shows that in the word reaction experiment, apparently senseless and remote associations are given by a larger number of leptosomatics (3 1 per cent) than of pyknics (0 2 per cent) Little faith, however, is felt in the interpretation that more remote associations are a sign of greater abstractive ability

This concludes our review of experiments in the dissociative field, even if we cannot accept the results as conclusive, there is no doubt that Kretschmer has succeeded in building up a strong prima facie case in favor of his view, which would deserve experimental verification by more advanced experimental and statistical techniques.

C Color-Form Reaction Type

The general hypothesis tested in this series of experiments may be stated as follows cyclothymes and pyknics show a distinct tendency towards color reactivity, while schizothymes and leptosomatics show a distinct tendency towards form reactivity This general view has been tested by a large number of authors by means of a great variety of different types of test, which it would be impossible to review here in detail An excellent history of all this work is given by Lindberg (**53**), who himself has provided what is probably the most impressive substantiation of the hypothesis We will merely note briefly some of the earlier work and then describe Lindberg's results in greater detail

(1) The earliest writer to draw attention to the cyclothyme color affinity was Scholl (**75, 76, 77**), who had his subjects pick out a colored figure from groups of similar figures in a tachistoscopic experiment Identification could be by color or form, and his 30 subjects were classified as cyclothymes or schizothymes, according to a questionnaire He showed a distinct color tendency among the cyclothymes and a distinct form tendency among the schizothymes at a $P < 01$ level of statistical significance

(2) Enke (**17**), in a tachistoscopic experiment with colored syllables, showed five cards with four nonsense syllables on each to his subjects Each nonsense syllable contained four to five letters; each syllable on the card was in a different color—black, blue, red, or green The subjects were required, in the first presentation, to note the color and the position, during the second, to note the letters.

Score was the excess of color answers over letter answers. With 184 subjects, the average score for pyknics was 10 2, for athletics 0 8, and for leptosomatics 1 4 The results showed significant color activity among pyknics, as opposed to the other two groups at the $P < 01$ level

(3) Mauz (**60**), in a Rorschach experiment on 100 normals, 59 of whom were pyknics, found a greater proportion of color answers among pyknics, and movement answers among leptosomatics He reports correct somatopsychic agreement in 87 per cent of the cases, a result which has a $P < 01$ level of statistical significance

(4) Enke (**10**) also carried out a Rorschach experiment and showed that among his pyknics 75 per cent were predominant color responders, among his athletics 30 per cent, and among his leptosomatics also 30 per cent On the other hand 0 per cent were predominant movement responders among the pyknics, 45 per cent among athletics, and 47 per cent of all cases among leptosomatics These results again are significant at the $P < 01$ level

(5) Dambach (**7**), using Scholl's main method, found cyclothymic children to be more color reactive and schizothymic children to be more form reactive

(6) Lutz (**55**), working on 30 children and using 6 tests altogether, came to the conclusion that "no form reactor is cyclothymic, no colour reactor schizothymic"

(7) Ritter (**71**), using Descoeudres's (**8**) method on 110 children, as well as Scholl's sorting box, interpreted his results in terms of Jaensch's (**31**) typology, identifying "form" with Jaensch's disintegrated types and "color" reactors with his integrated types, a result somewhat in line with Kretschmer's hypothesis

(8) Poppinga (**70**), working on 30 students clearly belonging to the color or form types and using a variety of tachistoscopic methods, was more critical than previous writers, but, nevertheless, came to positive conclusions with respect to Kretschmer's hypothesis

(9) Oeser (**65**), who like Ritter leans more towards Jaensch's than Kretschmer's theory, compared tachistoscopic studies with Rorschach results and concluded, as did Poppinger and Ritter, that integrated persons tend to belong to the pyknic type He is critical of the Kretschmer hypothesis, but as the number of cases studied by

him—32 students in all—is very small, it is difficult to draw any definite conclusions from his work

(10) Braat (3) studied 37 subjects by means of a tachistoscopic procedure He showed significant relations between constitution and color form reactivity, but failed to show any such relation between psychosis and color form reactivity (His group was made up of 17 leptosomatic schizophrenics, 6 leptosomatic manic-depressives, 10 pyknic schizophrenics, and 4 pyknic manic-depressives)

(11) Schmidt (**74**), using a very interesting experimental technique by means of which there was produced an apparent movement (somewhat akin to the phi phenomenon) which appeared as a turn to the left according to form, or as a turn to the right according to color, found agreement between color-form reactivity and typological diagnosis in 44 cases out of 54

(12) A study by Luth (**54**) dealt with 156 subjects He reports a high correlation between schizothymia and form reaction, and a rather less marked correlation between cyclothymia and color reaction He also observed concordance between color-form reactivity and leptosomatic-pyknic body type

(13) Lindberg's studies are more extensive than those of any other writer, and his statistical treatment rather more sophisticated Unfortunately, he was working within the confines of a psychiatric system, namely, that of Professor Sjobring (**80**), which will be unfamiliar to most readers Instead of using the terms of this system, we shall equate Sjobring's "sub-stable" type with Kretschmer's "cycloid," and Sjobring's "sub-valid" type with Kretschmer's "schizoid," as appears justifiable from Lindberg's own book (**53**) When that is done, we find that among the 424 adult psychotics studied by him there are highly significant differences between schizophrenics and manic-depressives in the direction of greater color reactivity among manic-depressives and greater form reactivity among schizophrenics This is true of both tests used by this author. Moreover, Lindberg took the trouble to calculate Stromgren's index of body build for a number of his subjects and showed significant relations between pyknic body build and manic-depressive illness, and leptosomatic body build and schizophrenic illness. Going one step further, he also showed that among pyknics there is a significantly

greater tendency to color reaction and among leptosomatics a significantly greater tendency to form reaction Thus, there appears to be little doubt from this experiment alone that leptosomatic body build, schizophrenic psychosis, and form reactivity tend to go together, while, on the other hand, pyknic body build, manic-depressive insanity, and color reactivity tend to go together This finding, of course, does not constitute proof that similar agreements would be found in normal material—a conclusion strongly suggested, however, by some of the other researches reviewed in this section

In summary, we may say again that the evidence is strongly suggestive but is certainly not conclusive The number of cases employed in each separate research was usually very small, the tests used by different workers very different, and, indeed, proof is lacking that all so-called tests of color-form reactivity would correlate together and define one general factor In correlating together three color-form tests, the writer found relatively low correlations (**19**), suggesting that most of these tests may measure relatively specific factors However, in spite of these criticisms, clearly, a prima facie case has been made for a closer scrutiny of the underlying dynamics of this group of tests

D Motor Movement

(1) Van der Horst (**89**), Kibler (**35**), and Enke (**13**) have all shown a tendency for leptosomatics to have a higher personal tempo (tapping at subject's favored speed for 30 seconds) than pyknics The average number of taps per 10 seconds by these three investigators are given in Table III below

TABLE III

RATE OF TAPPING (TAPS PER SECOND) AS A FUNCTION OF BODY TYPE

	Pyknics	*Athletics*	*Leptosomatics*
Van der Horst . . .	12	—	27
Kibler	11 7	—	16 4
Enke	12 8	22 8	28 1

There can be little doubt about the statistical significance of these data

(2) In a similar experiment Enke (**13**) showed that when subjects were allowed to pull a finger ergograph at a preferred speed for 30 seconds, the number of pulls was, respectively, 27 for pyknics,

43 for athletics, and 47 for leptosomatics ($P < 01$ for comparison of pyknics with the other two groups)

(3) Also investigated in this connection was the question of rhythmic movement Enke (13) showed that in working an ergograph with one hand and turning a wheel with the other there was a corresponding rhythmic movement of the two hands for 10 per cent of the pyknics, 53 per cent of the athletics, and 60 per cent of the leptosomatics ($P < 01$ for comparison of pyknics with the other two groups)

(4) Also relevant in connection with rhythmic movement is another experiment of Enke's (13), in which an ergograph had to be pulled to the sound of a metronome whose regular rhythm of four beats was disrupted by occasional three-beat rhythms This caused 25 per cent of the pyknics, 61 per cent of the athletics, and 80 per cent of the leptosomatics to hesitate or slow down—a result significant with the $P < 01$ level for the comparison of pyknics with the other two groups This finding, as well as the one mentioned next, may also be regarded as additional support for the "dissociative" hypothesis

(5) Liepmann (52) carried out the same experiment and found hesitation or slowing down in response to the altered rhythm in 100 per cent of his schizothymes and 0 per cent of his cyclothymes—a finding whose simple beauty can hardly atone for its unlikely perfection!

(6) Enke (13) reports an experiment dealing with partly involuntary motor movement, letting his subjects count in time with a one-half second metronome for 15 seconds He detected defective breathing technique in 8 per cent of his pyknics, 56 per cent of his athletics, and 49 per cent of his leptosomatics—a finding again significant at the $P < 01$ level

E Motor Co-ordination

Apart from quoting the corroborative evidence of work done by Gurewitsch (22) and Oseretsky (66, 67), Kretschmer (38) relies in the main on Enke in this connection

(1) In an experiment in which the subject had to trace letters with a metal stylus without touching the sides, Enke (13) found the following results (Table IV):

TABLE IV

STYLUS MAZE SCORES

	Pyknics	*Athletics*	*Leptosomatics*
Time (in secs) . . .	39 0	54 7	35 6
Errors . .	34.3	42 7	26 7

These results showed a distinct tendency for leptosomatics to make fewer errors than the other groups and to take less time over their task

(2) Enke (13) has reported another experiment, which, in its setup, is rather different from the other rather well-controlled experiments he reports in his book The subject has to carry a glass of water, which is full to the brim, across a room through the middle of which a thread is extended at a height of 40 cm above the ground He has to go to the other end of the room to pour what is left of the water into a measuring glass with a small opening (4 cm) Recorded are, firstly, the time taken to carry the water across the room and the amount of water lost in transit, and, secondly, the time taken to pour the water into the container and the loss of water during this process Table V gives the detailed results

TABLE V

RESULTS OF WATER CARRYING EXPERIMENT

	Time to Carry	*Loss*	*Time to Pour*	*Loss*
Pyknics .	21 secs	12.3 cm	14 8 secs	11 1 cm
Athletics	20 secs	14 1 cm	11 6 secs	12 1 cm
Leptosomatics	23 secs	11 3 cm	14 0 secs	9 4 cm

It will be noted that leptosomatics showed less loss in transit than the other groups

(3) Enke (13) also reported on a number of experiments on handwriting carried out with the aid of Kraepelin's "Schriftwaage" Plotting the difference between maximum and minimum pressure during writing, he found that the difference is largest for pyknics (109 gms) and almost equal for athletics (74 gms) and leptosomatics (77 gms) This is interpreted in terms of greater tension during writing for athletics and leptosomatics

(4) A similar interpretation is put on the data showing the percentage of cases in which the pressure curve returns to the zero line, which is 53 per cent in the case of pyknics, 12 per cent in the case of athletics, and 15 per cent in the case of leptosomatics In both these

experiments, differences between pyknics and the other groups are significant at the $P < .01$ level

(5) Enke (13) also analyzes the type of curve produced, finding regular, simple types of curves in 57 per cent of the pyknics, 8 per cent of the athletics, and 18 per cent of the leptosomatics, while irregular and zigzag curves are found in 43 per cent of the pyknics, 92 per cent of the athletics, and 82 per cent of the leptosomatics These results again are significant at the $P < .01$ level for comparison between pyknics and the other groups

(6) Three further experiments are quoted by Enke (13) to show the inferiority of the athletic group to the others in respect to motor co-ordination He asked his subject to construct a small mechanical model from eleven pieces, to make a number of holes with a special tool, and to carry out a sorting test Results on these three tests are reported to bear out his general hypothesis

F Perseveration

(1) Findings regarding perseveration depend not so much on separate experiments as on data collected incidentally during the course of experiments already reported One of the earliest findings to indicate the greater perseveration of leptosomatics was reported by Van der Horst (89), who showed that in comparing leptosomatic schizoids with pyknic cycloids on the Word Association Test, there appeared a greater tendency towards repetition among the former, the values being 2 2 per cent and 0 3 per cent respectively.

(2) Enke (13) showed that in the experiment with the colored syllables in which the subject is required to memorize either the color or the letters, a change in instruction will leave 21 2 per cent of the leptosomatics still perseverating against 17 6 per cent of the athletics and 8 per cent of the pyknics—a result discriminating between pyknics and the other groups at the $P < .01$ level

(3) Rather less impressive, but still of interest, is Enke's finding (13) that in the three tasks mentioned at the end of the last section (construction of small mechanical models, making a number of holes, and a sorting test) there is a distinctly greater amount of perseveration to be observed among leptosomatics than among other groups

(4) Enke (13) describes in connection with the tapping test that

the distraction from the favored speed of the subject to a superimposed rhythm is more difficult for leptosomatics and athletics, which he interprets in terms of the greater perseveration of these two groups

(5) Also in connection with the tapping test, Enke (13) shows that 93 per cent of pyknics wander all over the plate during their tapping instead of staying still, while only 44 per cent of the athletics and 38 per cent of the leptosomatics do so—a finding again interpreted in terms of perseveration ($P < .01$)

(6) Enke (13) also reports that the number of subjects giving regular movements with a metronome in the ergograph experiment is 31 per cent among leptosomatics, 21 per cent among athletics, and 0 per cent among pyknics This finding also lends support to the hypothesis of greater perseveration among leptosomatics ($P < .01$)

(7) Enke (13) gives figures to show that in the ergograph experiment, after the metronome had stopped, 12 per cent of leptosomatics, 8 per cent of athletics, and 0 per cent of pyknics still continue to look at the metronome, thus showing a certain amount of perseveration ($P < .01$).

G Affective and Autonomic Reactions

Much of the work in this field has been done with the aid of the psychogalvanic reflex The subject in this experiment lies quietly on a couch in a dark room, two electrodes being placed on his arms above the wrists Readings are taken every 5 seconds

(1) Kretschmer and Enke (46) show under these conditions that the difference between maximal deflection and final resting value in terms of an arbitrary scale are as follows for 90 normal subjects (30 in each of the three groups). pyknics 80 mm , athletics 104 mm ; and leptosomatics 161 mm

(2) The time of getting to the resting level is reported to have been 9 02 minutes for pyknics, 8 46 minutes for athletics, and 13 51 minutes for leptosomatics

(3) Failure to reach a final resting level is reported in 6 per cent of the pyknics, 3 5 per cent of the athletics, and 45 per cent of the leptosomatics—the difference between leptosomatics and the other groups being significant at the $P < .01$ level

(4) In another part of the experiment, the subject is instructed

to think of a number between 1 and 9 consistently The subject is told that the experimenter will afterwards say a series of numbers aloud and tell the subject which of them he (the subject) has thought of The score is the sum of the deflections after the instructions have been given, after counting has begun, after the number before the one thought of is pronounced, and after the number thought of is pronounced The sum of these deflections was 38 mm in the case of the pyknics, 46 mm in the case of the athletics, and 70 mm in the case of the leptosomatics

(5) In the next experiment, reactions are reported to unpleasant and pleasant smells, a prick, and a toy pistol shot, and also the number of seconds required before the return to the resting level. Results are given in Table VI

TABLE VI

MAXIMUM DEFLECTION (IN MM)

	Pyknics	*Athletics*	*Leptosomatics*
Pleasant odor	17	18	33
Unpleasant odor	12	19	26
Prick	36	22	28
Pistol shot	29	38	64

RETURN TO RESTING LEVEL (IN SECS)

	Pyknics	*Athletics*	*Leptosomatics*
Pleasant odor	61	93	101
Unpleasant odor	54	63	87
Prick	121	98	149
Pistol shot	118	129	192

All these results show a much greater autonomic reactivity of the leptosomatics, and a much smaller reactivity of the pyknics, with the athletics usually in the middle, between the other two groups.

SUMMARY

We may summarize briefly Kretschmer's contention and his interpretation from the experiments reported in this article He believes that he has shown that corresponding to a pyknic-leptosomatic type factor in the constitutional field there is a cyclothymic-schizothymic factor in the mental field. These factors and their correlations are supposed to extend far beyond the psychotic field and to be of equal importance for normal people The personality of the cyclothyme and the schizothyme is characterized in operational terms by means of a large number of experiments. Kretsch-

mer believes that he has shown a marked tendency for schizothymes to have a mind which he variously describes as "dissociative," "abstractive," or "analytic," whereas the cyclothyme is credited with a mind which is "synthetic," "global," or "integrative" The schizothyme is shown to be more form reactive, whereas the cyclothyme is shown to be more color reactive—a finding the implications of which are believed to lie along a line of explanation which emphasizes the relation between color and the expression of emotion The schizothyme is believed to have a quick personal tempo, the cyclothyme to be rather slow, schizothymes have their work rhythm interrupted rather more easily than cyclothymes and have a greater tendency towards rhythmic movement With respect to motor coordination, schizothymes are superior to cyclothymes, but they show greater evidence of tension, and their handwriting is far more irregular Schizothymes tend to be more perseverative than cyclothymes and show a very much greater degree of affective and autonomic reactivity than do cyclothymes

This then is a brief and necessarily incomplete summary of Kretschmer's main contentions and of the evidence which he brings forward to support them. We must next turn to an evaluation of this evidence

Evaluation

In order to evaluate Kretschmer's work properly we must bear in mind two things in the first place, the logical and methodological considerations underlying his experiments, and, secondly, the mathematical and statistical methods used. It is perfectly clear that the latter are rudimentary and inadequate for his purpose—a fault often found in German work Even simple considerations of significance of differences are usually overlooked by Kretschmer and his fellow workers, and interpretations are made of slight differences which are, quite obviously, well below any acceptable level of confidence However, by and large, it is doubtful if a proper statistical investigation of the figures given would disprove his main contentions as outlined above We have shown in a number of cases that differences found by him and his followers are definitely significant when classical tests are used, and, even where no such tests are possible because standard deviations are not given by Kretschmer, the writer has no hesitation

in saying, from his own experience with similar tests and the rough range of standard deviations to be expected from them, that, in the majority of cases, the results would be acceptable and significant. This general conclusion is strengthened by the fact that in many cases an experiment is repeated by several workers, usually with similar results Thus, we may conclude that while the statistical appraisal of the data is crude and sometimes almost nonexistent, nevertheless, a not too rigid view of the results revealed them as deserving a relatively high degree of confidence It is when we come to the methodological considerations, however, that certain feelings of uneasiness become more insistent

The writer (19) has defined a trait as "an observed constellation of individual action tendencies," a definition with which Kretschmer would probably agree Yet, when dealing with a trait such as dissociation, color-form reaction, or perseveration, it must be noted that he substitutes for "observed constellation" a purely interpretive criterion In other words, Kretschmer has originated five or six different tests of dissociation, the hypothesis being that each of the tests measures this particular mental trait to some extent The link beween all these tests, however, is a purely theoretical or interpretive one, that is to say, it is assumed that there is something in common between them, namely, dissociation, but no proof is given of this contention In the writer's view, the only way of proving the hypothesis underlying Kretschmer's use of the term would be a correlational and factorial study of the tests in question and a definite demonstration that a general factor of dissociative ability could be found to run through all of them, a factor, it should be noted, which could not be identified with any of the factors already isolated in the cognitive or the affective spheres The same applies, *mutatis mutandis,* to the various other traits that Kretschmer mentions, such as a color-form tendency, perseveration, personal tempo, and so forth. Before we can admit these traits as acceptable building stones in the construction of a scientific system of personality, we must be sure that the various tests supposed to measure them really share in common some underlying ability or tendency which can justifiably be identified with the hypothetical trait

Kretschmer is not entirely unaware of this necessity, but his

proof is logically faulty While defining, as does the present writer (19), a type as "an observed constellation or syndrome of traits," he does not draw the obvious conclusion that we must first identify our traits and then isolate the type by means of the observed intercorrelation of traits, instead, he tries to prove the existence of the traits by arguing from the existence of a type In other words, he shows that one test of perseveration discriminates between cyclothymes and schizothymes and that another test of perseveration also discriminates in the same way, this he seems to regard as sufficient proof that both tests measure perseveration, which is, of course, a logical fallacy The writer has shown that a test of suggestibility discriminates between neurotics and normals and that a test of persistence also discriminates in this fashion, and that accordingly the two tests correlate (19) It does not follow from this that persistence is the same thing as suggestibility, and, indeed, the proof that the tests in question are tests of persistence or suggestibility has to be given in terms of separate factorial studies embodying different types of suggestibility and persistence tests

Therefore, while we cannot consider Kretschmer's contention regarding the various traits mentioned as proved, it must be emphasized that his work is extremely suggestive and that it seems certainly worth while to investigate by more advanced methods than he used the concepts of dissociation or of color-form tendency

While Kretschmer places much importance on these traits, as we may, perhaps, call them in conformity with modern psychological usage, the mainstay of his whole system, of course, is the cyclothymic-schizothymic dichotomy. We have already criticized his method of proving that this dichotomy, whose existence in the psychotic field few would deny, can and should be accepted in the normal field A more direct method than the one used by him, which relies on the possibly irrelevant *tertium quid* (the pyknic-leptosomatic dichotomy), is required for this purpose. Such a method will be outlined and an experiment using it will be reported in the second paper of this series, but here we will note what we consider to be the strongest argument against Kretschmer's method of proof

While he shows that there is a correlation between body-build and the two main types of functional psychotic disorder, that correla-

tion is not very high, and the writer has shown elsewhere (19) that body-build is correlated with other variables (neuroticism, extroversion-introversion) which are unrelated to the Kretschmerian concepts If that be so, then clearly many of Kretschmer's findings, which appear superficially to support his views, may in reality have quite a different explanation To give just one example, it will be noted that in experiment E 2 the leptosomatics are slow and accurate, whereas the pyknics are quick and inaccurate This may be interpreted in Kretschmerian terms, however, an alternative explanation is possible The writer has shown (19) that hysterics tend to be of a more eurymorphic (pyknic) body-build than anxiety states and reactive depressions (dysthymics), who tend to be leptomorphic in body-build. It has also been shown that hysterics tend to be quick and inaccurate, whereas dysthymics tend to be slow and accurate (19) It follows from this that there should be a correlation between body-build and a speed-accuracy test of the kind found by Kretschmer, but the interpretation of the experiment may be in terms quite different from those advanced by Kretschmer, using concepts essentially alien to his system It is because of the dangers of indirect proof, exemplified in this case, that a more direct method of examining Kretschmer's hypothesis becomes necessary

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