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CRIME AND THE CONSTITUTION HUMAN: A SURVEY

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The common belief that body build is somehow related to function not only in general behavior, temperament, and disease as well as in socially unacceptable acts finds expression in folk-saying, verse, clinical observation, etc. Thus Shakespear's Caesar reflects:

“Let me have men about me that are fat;
Sleek-headed men, and such as sleep o' nights;
Yon Cassius has a lean and hungry look;
He thinks too much; such men are dangerous.”

And E. A. Robinson's

Miniver Cheevy, child of scorn
Grew lean while he assailed the seasons;
He wept that he was born
And he had reasons.

The *aim* of the present paper is to survey the extent to which American investigators continue to rely on constitution, especially body build, and other morphological traits, in the study of crime causation. The period involved will be that from about the beginning of World War II in 1939 to the present.

Historically, the term *constitution* has usually denoted body build as produced by internal factors. Awareness of external influences—especially nutrition—on body build has, however, long affected discussions of human constitution. The most inclusive definition of constitution is that by Tucker and Lessa (1940) as “the sum total of the morphological, physiological, and psychological characters of an individual, with additional variables of race, sex, and age, all in large part determined by heredity but influenced in varying degrees by environmental factors, all of which, when integrated and expressed as a single biological entity, fluctuate in varying degrees over a wide range of ‘normality’ and occasionally cross an arbitrary boundary into ‘abnor-

mality' or pathology." A similar definition of constitution, though not so adequately phrased, is that by Draper, Dupertuis, and Caughey (1944, pp. 1, 15) who equate (p. 2) constitution with personality.

BRIEF HISTORY

American interest in the possible relation between constitution and crime appeared as early as the late 1920's, but has not developed so extensively as in Europe. Kretschmer's theory and typology, which had found favor among European criminologists, was applied by Mohr and Gundlach (1927 and 1929) to native White male prison inmates in Illinois. An anthropometric study of body-build among Illinois adult male prisoners was made by Gray (1934). The major study of crime and morphology is that by Hooton (1939a, 1939b) which had its inception in 1926 with a study of the male prisoners in Massachusetts county jails and, eventually, was extended to include male criminals in ten regionally distributed states. The most recent report on crime and constitution is Sheldon's (1949) *Varieties of Delinquent Youth*¹ the advent of which was indicated in his *The Varieties of Temperament*¹ (1943). The foundation for the later studies was published as *The Varieties of Human Physique* (1940).¹ Minor studies of the relation between crime and morphology are those which concern only one or, at most, a very few traits—usually defects—in relation to delinquent behavior. Within this category belongs Kilmer's (1932) report that 44 per cent of a group of criminals has "flap" ears against 23 per cent in a control sample.

A most significant study for the problem of crime and the constitution, since the obverse facet of behavior is presented, is that by Damon (1946) on the subject of physique and achievement in military flying. Almost equally important is Seltzer's (1946) "Study of body proportions and dominant personality traits."

Another approach to the relation of morphology and behavior is that of factor analysis by which one or a few "weighted" factors represent an entire set of dimensions (Thurstone, 1946, 1947).

THEORIES, METHODS, AND TECHNIQUES

Many, if not the majority, of the theories, methods, and techniques used by American students of crime and constitution have been adopted from European sources and modified or supplemented when advisable.

Kretschner's essentially inspectional technique of classifying body

1. Hereafter designated by the abbreviations: vdx, vt and vhp, respectively.

build, which was objectified by a few measurements, was adopted by Mohr and Gundlach (1927, 1929-1930) and used in conjunction with a battery of psychological tests.

A covert premise that the body-build of convicts may be more or less distinctive apparently underlies Gray's (1934) study of Illinois convicts. Measurements of head and body were taken according to anthropometric technique as prescribed by Hrdlicka.

The major premise of Hooton's study of the American criminal is that the behavior of the various kinds of animals is, in a general way, an expression of their specific structure; likewise, the behavior of Man, subject to individual variation and some environmental modification, is a function of structure. Further,

"It may . . . be postulated that different physical racial types of man will display mental and emotional qualities diverging one from another, in conformity to their respective peculiarities of physical organization which are of hereditary origin . . . Again, since different types of criminal acts are obviously the results of diverse motives and widely different psychological causes, it is clear that any physical or mental differentiation of the criminal should manifest itself amongst criminals classified according to their types of offense, as well as between criminals as a group and non-criminals." (CM,² pp. 7, 9-10)

The specific problem considered by Hooton is whether the physical characteristics of criminals are related to anti-social conduct. (The extent to which such conduct is influenced by mental sufficiency or insufficiency, or by mental health, or by social milieu was not part of the investigation.) The methodology and techniques used in the research are those of physical anthropology. The measurements taken were essentially in accord with Martin's (1928) *Lehrbuch* while the standards for the somatoscopic (inspectional observation or morphology) characters for the Whites, at least, were based (AC,² p. 37) on the modal development of each feature of the adult male of northwestern Europe. Body build was expressed by categorizing the total offense group of the native Whites of native parentage as well as that of the Negroes and Negroids, respectively, into stature-weight classes on the basis of the distribution of height and weight between plus and minus one standard deviation and beyond plus and minus one standard deviation.

The concepts and theories, the methods and techniques, of Sheldon represent an attempt to develop a biologically oriented psychology, i. e., an operational or constitutional psychology. The basic premise is "that behavior is a function of structure." (VDY, p. 3.) Structure and

2. CM, the abbreviation for CRIME AND THE MAN, will be used hereafter in referring to that book while AC will be used as the abbreviation for THE AMERICAN CRIMINAL.

behavior, it is postulated, are a continuum which constitute the personality of the individual. To implement research in this field a methodology is required which will express this continuum in terms of components—or more aptly stated, variables—“which can be measured and quantified at both the structural and behavioral ends,” i. e., “the anthropological and psychological ends.” (VDY, p. xv.) The methods of constitutional psychology begin with an analysis and description of body build (physical constitution). The technique of somatotyping, a term coined by Sheldon, involves an inspectional judgment and rating of the amount of each of three components which—as is widely assumed in Europe—Sheldon believes are the constituent parts of bodily build. The somatotype rating is expressed by a 3-digit number. The index of temperament devised by Sheldon consists of a 3-digit number, one for each component of the index; likewise, for the index of psychoneurotic tendency. Standardized lists of structural traits have been developed for assessing each of the components of the respective indices.

The implicit thesis of Damon's study may be stated as a paraphrase of that of Sheldon: performance is a function of structure. Specifically, the hypothesis is to the effect that physical traits may be consistently associated with success in training and combat flying. The task was to discover any such traits, to ascertain their strength and the scopometric³ (measurement and observation) techniques most likely to reveal them. Groups at four levels of flying achievement were compared by: 1) standard anthropometric measurements; 2) by disproportions in certain body ratios; and 3) by Sheldon's somatotypes. Somatotypes were rated by direct inspection and $\text{height}/\sqrt[3]{\text{weight}}$,³ instead of the prescribed photographic techniques. (Original classification of the men into the different grades of flight personnel was chiefly by an elaborate battery of psychological aptitude tests.)

The statistical methods and techniques employed are the common statistical constants: mean, standard deviation, coefficient of variation, and probable error. For testing the significance of the difference between means, Mohr and Gundlach used the standard error of the difference while Hooton used the probable error of the difference. The product-moment coefficient of correlation was used generally. Mohr and Gundlach employed also partial correlation while Hooton used the correlation ratio. The coefficient of mean square contingency was used by Hooton in order to test the association of pairs of qualitative characters. Adequate sampling is a basic problem, one with which Hooton was especially plagued. In Hooton's study, personal error,

3. A term employed here, but introduced by Cabot (1938).

variation due to inbred physical types within each state, age factors, etc. were all subjected to statistical check. Extensive use of frequency distribution tables is made by Sheldon who uses, also, scattergrams to show the distributions of somatotypes, indices of temperament, and the psychiatric index.

Multiple factor analysis, which involves "weighting" of factors, is a relatively recent approach to the analysis of body types (Thurstone, 1946, 1947). The major premise is that one or more linearly independent parameters or factors suffice to describe an entire set of body measurements if the latter are generally correlated. A secondary premise (Thurstone, 1947) is that one or more of these factors may be functionally related to temperamental characteristics.

BIOTYPOLOGY AND INTERPRETATION

"Our task," Hooton announces in *Crime and the Man* which describes and summarizes his entire investigation of the American male criminal—White, Negro, and Negroid, "is to study the physical characters of criminals for the purpose of discovering whether or not these are related to anti-social conduct." His approach is soon disclosed as essentially a metric and morphologic assay of physique-behavioral entities whose conduct is premised as organically determined for the most part. The criminal (p. 8) is "a person who is under sentence in a penal institution, having been convicted for an antisocial act punishable by imprisonment."

Data were obtained from prisoners of the county jails in Massachusetts as well as from the subadult and adult male prisoners in the reformatories and prisons of North Carolina, Tennessee, Kentucky, Wisconsin, Missouri, Texas, Colorado, Arizona, and New Mexico.

For control samples, criminal insane males in Massachusetts and Colorado were matched against a civil insane series; the criminal insane Negroes of North Carolina were similarly matched. Control samples for sane Negro criminals were found in North Carolina and Tennessee. The check samples for comparison with the 4,212 Old American White offenders (native whites of native parentage) consisted of 146 Nashville, Tennessee, firemen and 167 Massachusetts civilians, preponderantly militiamen.

The distribution of the entire sample was: prison and reformatory inmates 10,953; county jail (Mass.) 2,004; criminal insane 743; defective delinquents 173; insane civilians 1,227; sane civilians (White 909; Negro and Negroid 1,067) 1,976; total 17,076.

The data collected for each individual comprise 22 measurements and 13 indices (percental relation of one dimension to another) together

with 33 main categories and 72 sub-categories of morphological features. Name, age, birthplace, birthplace of parents, occupation, education, previous convictions, length of sentence, marital status, offense, religion, race and ethnic (nationality) derivation were obtained also. Where reliable data was recorded, IQ's, mental classification, and medical pathologies were collected.

The total offense group was divided into ten categories: murder—first degree, second degree; assault; robbery; burglary and larceny; forgery and fraud; rape; other sex offenses; versus public welfare; arson and all other offenses. Differences between the means of the measurements for the Old American civilians and for the total offense group of Old Americans as well as for the various offense groups with respect to the total offense group of Old Americans are shown in Hooton's tables, XI-30 and V-79 to V-88 (AC). Scrutiny of the tables reveals that in 17 of 19 measurements, the means for the total offense group (mean age ca. 31 yrs.) are smaller than those of the civilian check sample. The total offense group differs from the total civilian group in being significantly less—i. e., 4 or more X P. E. diff.—in age (3.8 yrs.); weight (11.7 lb.); stature (1.0 cm.); in shoulder and chest breadth by 0.4 and 0.7 cm., respectively; and in several head and face dimensions by 0.8—6.6 mm.^{3a} Nose breadth relative to nose length and ear breadth relative to ear length is significantly greater in the total offense group. Among five traits for which the total offense group differs from the total civilian group by 3—4 x P. E. diff., the offense group is smaller in three characters.

Among the ten offense groups, the first degree murder as well as the burglary and larceny group differs from the total offense group by 4 or more X P. E. diff. for eleven traits, including age. Whereas the murderers are somewhat larger and older (by 4.6 lbs., by 1.1 cm. in stature, and by 7.1 yrs.), the burglars and larcenists are somewhat smaller and younger (by 1.9 lbs. and 4.0 yrs.) than the total offense group. For the remaining traits, all linear, these two groups differ significantly from the total offense group by 2 mm. (in mean chest breadth) to 5 mm. (in mean chest depth) for the first degree murder group, and by 0.2 mm. (in mean nose breadth) to 2 mm. (in mean chest breadth and mean chest depth) for the burglary-larceny group. The robbery as well as the burglary-larceny group is the only one significantly younger than the total offense group; all other offense groups are significantly older (3—4 or more X P. E. diff.). In physical dimensions, the remaining offense groups differ significantly from the total

^{3a}. A difference of 6.60 mm. was found for head circumference only—a technically troublesome measurement. The next greatest difference, 2.40 mm., was for ear length.

offense group in from two (for the assault group) to seven (for the versus public welfare group) traits among a total of 32 physical characters.

With respect to the several offense groups, Hooton found that: ". . . eight of ten offense groups of criminals are anthropometrically distinct each from the total series. In general, also, we may assert that the average bodily form of the criminal varies with the type of offense he commits." (CM, p. 70.) Further, "Native White criminals of native parentage are not only distinguished from each other by offense groups in sociological characteristics, but also in anthropometric and morphological features. Thus, it is suggested that crime is not an exclusively sociological phenomenon, but is also biological." (CM, p. 75.)

Additionally, Hooton discovered (CM, pp. 366-367) that:

"The ordinary offense group distinctions which have been demonstrated in Whites seem to obtain to a large extent in Negroes and Negroids . . . At present, I can offer no satisfactory explanation of the fact that bootleggers persistently have broad noses and short faces with flaring jaw angles, while rapists monotonously display narrow foreheads and elongated, pinched noses. It is well nigh incredible that these features should manifest themselves alike in the Whites, Negroes, and Negroids of these offense categories, but they in fact do."

In view of the interest in the possible association of physique and crime, which the work of Kretschner and others had stimulated, Hooton sought the expression of body-build types in the several offense groups. The Old American total offense group was classified into nine stature-weight categories. Summarizing the data, Hooton found (CM, p. 376) that: "tall, thin men tend to murder and to rob; tall, heavy men to kill and to commit forgery and fraud; undersize, thin men to steal and to burglarize; short, heavy men to assault, to rape, and to commit other sex crimes, whereas men of mediocre body build tend to break the law without obvious discrimination or preference." Burglary and larceny form the bulk of crime by all varieties of body-build. Recidivists are most frequent among those of short-slender build, but are almost as numerous among those of short-medium and those of medium-slender build. The majority of offenders among all body-types when in civilian life were engaged in extractive pursuits (agriculture, animal husbandry, forestry, fishing, and mining); or, secondly, in factory work, or thirdly, in unskilled labor. Contrariwise (CM, p. 339), "The marked associations of body build with offense found in the Old American Whites are conspicuous by their absence in the Negroes and Negroids."

To study the relation of ethnic background to crime, Hooton classified the native white criminals of foreign parentage and the foreign white criminals into nine groups: Irish; Italian; British; Scandinavian;

Teutonic; French-Canadian; Spanish-Portugese; Croats, Slovenes, Czechs, and Austrians; and Eastern and Near Eastern. The author reports (CM, p. 200) that criminals of these groups "are as clearly and consistently different from their comparable check samples in physical anthropological features as in their sociological features."

To investigate the association of race with crime, a racial classification of the whites was established on the basis of stature, the cephalic index, and the nasal index. Employing these criteria, 5,689 criminals—native whites of native parents, native whites of foreign parents, and foreign-born whites—were typed in one or another of the following nine categories: Pure Mediterranean; Keltic; Nordic Mediterranean; Predominantly Nordic; Pure Nordic; East Baltic; Nordic Alpine, Dinaric, and Pure Alpine. The conclusion reached (CM, pp. 250-252) is that "race is definitely associated with choice of crime, and with sociological status" and that, with the exception of the Italian, "race seems to be a stronger determinant of crime than [does] nationality." Considering Negroes, Negroids, and whites, Hooton finds (CM, pp. 335-336) that "irrespective of racial differences, rather similar anthropological types and persons of equivalent sociological status appear to exercise the same criminal preferences."

The criminal insane Hooton found to differ significantly from the civil insane in deeper chests, lower relative sitting height, and longer and narrower ears as well as in several morphological traits. A successive decrease in quality of physical and mental traits was discovered in a comparison of civilian sane, criminal sane, civilian insane, and criminal insane. Strong evidence was disclosed of the existence of specific racial tendencies to insanity, and particularly of insanity combined with criminality. (CM, pp. 270-275, 289, 383.)

Environment—which many would regard as potent, if not determinative, in criminal behavior—is characterized by Hooton (CM, p. 181) as: "the universal alibi for failure." Within the environment, the element common to all constitutions, the organically inadequate precipitate to their own level: "It is not inequality of opportunity, but inferior capacity for grasping environmental opportunity which stigmatizes the anti-social New American." (CM, p. 190) Yet, Hooton finds (CM, p. 369) it "... rather difficult to avoid the conclusion that a depressed physical and social environment determines Negro and Negroid delinquency to a much greater extent than it does in the case of the whites."

Seven hundred fifty tables—which bolster *The American Criminal*, Vol. I, and presumably similar numbers for the remaining two prom-

ised volumes, loom in the background of Hooton's major conclusions:

"Criminals are organically inferior. Crime is the resultant of the impact of environment on low grade organisms [AC, I: 309] . . . within every race it is the biologically inferior, the organically unadaptable, the mentally and physically stunted and warped, and the sociologically debased—who are responsible for the majority of crimes committed." (CM, p. 252)

What, then, are the physical stigmata of biological inferiority which distinguish the criminal from the civilian? For the Old American criminal (CM, pp. 120, 128), it is his significant deficiency in age, stature, weight, shoulder breadth, chest breadth and depth, total face height and nose height, and height of face relative to breadth as well as his significantly greater breadth of nose relative to its height, his greater breadth of forehead relative to facial breadth, his greater sitting height relative to stature, his narrow jaws, and his rather small but relatively broad ears. Similar differences were found (CM, p. 195) between the New American criminals and civilians. Of the measurements of the nine racial types of white criminals, 33.9 per cent were significantly smaller, 8.5 per cent significantly larger, and 57.6 per cent indifferent. The general trend of the morphological differences among these same racial types of criminals disclosed that, compared with the corresponding civilian check samples, the criminals

"have straighter hair, more mixed patterns of eye color, more of the various kinds of skin folds in the upper eyelid, lower and more sloping foreheads, more pointed chins, more extreme variations in the projection of cheek bones, ears with less roll of the rim, and a greater frequency of Darwin's tubercle—a cartilaginous nodule on the free margin of the ear." (CM, pp. 238, 240) Yet, Hooton is quick to emphasize (CM, p. 104) the non-existence of any such creature as a criminal type identifiable by "any rigid multiple combination of morphological features . . . All that can be expected of the typing of criminals is that excesses of this or that kind of offense may be demonstrated for the several type subgroups."

A barrage of criticism showered Hooton's reports. The chief items under fire were the statistical methods and techniques, and the inferences and interpretations.

From the demonstration of significant differences between the offense group and his civilian check samples in the frequencies of a melange of physical characters, Hooton inferred an association between such a high frequency and criminal behavior. He then felt warranted (CM, pp. 342-343) in the inference that these characters are indicative of biological inferiority. Thus, seemingly, he arrived at the conclusion that "criminals are organically inferior," (AC, p. 309) and "that the primary cause of crime is biological inferiority." (CM, p. 130.) This physical inferiority is assumed by Hooton to be chiefly hereditary (AC, I: 308); likewise, that these inferiors drift into unfavorable social

environments where the weaker among them yield to social stresses which force them into crime.

The tacit assumptions and the circular reasoning involved in the foregoing conclusions have been noted by several critics (Sutherland, 1939; Merton and Ashley-Montagu, 1940; Lessa, 1943; Reckless, 1943) and others. The obverse of Hooton's findings lends, however, some support to his thesis. In a study of physique in relation to personality traits, Cabot (1938, p. 92) discovered that the athletosome (mesomorph in Sheldonian terminology) is superior to the average leptosome and to the pyknosome in psycho-social characteristics. Cabot, therefore, postulates "a new theory of sociobiological advantages in terms of which socio-sthenic traits and personality characteristics are associated with biologically 'good' physique."

Increased linearity of the white criminal which Hooton views as one of the stigmata of biological inferiority, certainly does not obtain among his Negro and Negroid criminals (CM, p. 353 ff.) unless comparisons are made with college Negroes and Negroids. The increased linearity of Hooton's white criminals may involve some other factor, possibly sampling, since Mohr and Gundlach found (1929) that, even with age controlled, Illinois criminals were more robust than the average of World War I draftees; hence, the authors concluded that criminals are from the more athletic segment of the general population. These findings recall those of von Rhoden in Europe who found criminals more likely to be of athletic build than pyknic or leptosome. In a study of delinquent Chicago boys, Rosenbaum (1941) and Reynolds found Negro delinquents to be physically superior to Negro non-delinquents in the delinquency areas.⁴ Similarly, the 200 delinquent Boston youths studied by Sheldon (VDY) have a mean somatotype preponderant in mesomorphy with a moderate amount of endomorphy and a little ectomorphy.

On the assumption that Hooton, when he spoke of biological inferiority, meant morphological nearness to the anthropoid apes or to primitive peoples, Merton and Ashley-Montagu (1940) proceeded to demolish the pertinent evidence they found Hooton had adduced.

The majority of the metric and many of the morphologic stigmata enumerated by Hooton have impressed the student of human growth (*cf.* also Sheldon, VDY, p. 754) as chiefly symptomatic of growth failure, whether hereditary or socio-economic or both sets of influences are

4. Clifford Shaw ventured the hypothesis that in a delinquency area into which Negro families have recently immigrated, the dominant delinquent groups accept into their ranks those Negro boys most similar to them in appearance and these acquire and transmit patterns of delinquent conduct.

causal. Well-authenticated increases in human stature and weight during the last half century or so have been described (Bowles, 1932; Shapiro, 1939; Andrews, 1943; Goldstein, 1943; and Meredith and Meredith, 1944). The consensus among observers is that increased height and weight of today's children and adults in comparison with those of previous decades have resulted chiefly from improved socio-economic and health factors. The continued presence, however, of deficient growth has been indicated by Stuart (1946, p. 202) who states that study of the growth and development of adolescents "has recently been greatly stimulated by a national realization that an unnecessarily large proportion of American youths are handicapped by faulty development or physical defects at the time when they must begin to assume the responsibilities of adult life." The effects of neglect (Talbot, Sobel, and associates, 1947) as well as the results of intelligent treatment in growth failure (Wetzel, 1948) have dramatized the course and consequences of growth failure as well as of successful growth. While the factors of improved food supply and hygienic conditions are important to successful growth (Cohen and Abram, 1948; Litman and Bosma, 1948, *et al.*), the influence of peaceful, congenial home and community surroundings are not to be minimized (Talbot, Sobel, and associates, 1947; Binning, 1948; Angel, 1949). "It does appear," says Stuart (1946), "that psychologic problems in adolescence may have much to do with the rounding out of physical development in this respect [adequate growth and development of muscle] and that they deserve attention." The role of heredity in successful or unsuccessful growth is obviously important (Gates, 1946; Little, 1947; Streeter, Park, and Jackson, 1931), but must be evaluated along with environmental factors. In brief, to paraphrase Bauer (1945), heredity determines what the organism can do while environment determines what it does do.

One of the major weak points, of which Hooton was aware and for which he tried to compensate statistically, in so far as possible, is the small size of the control samples, especially that for the Old American criminals. Modern sampling theory would insist that not only must the control samples be commensurate in numbers, but they should represent adequately the racial, ethnic, age, geographic area, and socio-economic attributes which characterize the social stratum of the civilian population from which the offense group(s) derive. Various weaknesses in the sampling for *The American Criminal* were reported by Ross (1939); Merton and Ashley-Montagu (1940); *et al.*

Attacking in detail the statistical treatment of the data for the

Old American criminal (AC, vol. 1), Wallerstein and Wyle (1947) ultimately find scarcely any connection between Hooton's data and his conclusions.

The most definitive judgment of Hooton's contribution to criminology is perhaps that rendered by 45 persons—psychiatrists, psychologists, sociologists, and a few others doing research in the field of delinquency and crime. (Reckless, 1943, p. 159.) Among the ten studies "which they believed had contributed most to the increase of our knowledge of delinquent and criminal behavior, and [ranked] in order of importance," Hooton's work is not named.

A more explicitly formulated and comprehensive approach than that of Hooton to crime and constitution is embraced within Sheldon's operational or constitutional psychology which, like Hooton's study, has for its thesis: "behavior is a function of structure."

The body is considered (VHP, pp. 4, 46) as comprised of three components of which the first is *endomorph*y (distinguished by soft roundness), the second *mesomorph*y (square muscularity and skeletal massiveness), and the third *ectomorph*y (linearity and fragility of build). Each component is postulated as present to some extent in every build (pp. 29, 47), and each component is regarded (pp. 36, 111) as dominated by tissue derived from the respective embryonic layers: endoderm, mesoderm, and ectoderm. Two Europeans, Huter (1880) and von Rhoden (1927), likewise, used this derivational concept, but Sheldon is responsible for its present elaboration.

Identification of the characteristics distinctive of each of the three components resulted from scrutiny of 100 selected, precisely standardized photographic examples of each extreme variant from the "average" male body in a sample of 4,000. A component is defined, then, in terms of those traits of morphological variation which distinguish one extreme variant from the others. For the study, 4,000 men of college age were photographed in accordance with rigid standards for posing, lighting, and scale. Front, back, and profile views of the nude body could be examined on the same print. (The chief traits for each somatotype (body-type) are listed in Table I, below).

A 3-digit number, each digit indicating the amount of each component—with 1 the minimal and 7 the maximal amount, yields a shorthand description of each physique, or somatotype—to use Sheldon's term. (Half points in later versions produce a 13-point scale.) The sum of the components ranges from 9-12. An extreme endomorph, for example, is 7-1-1, i.e., 7 in endomorphy and 1 in meso- and endomorphy; an extreme mesomorph is 1-7-1; an extreme ectomorph is

1-1-7 while an individual at the midpoint in all three scales is characterized as 4-4-4. Among the 343 (i.e., 7^3) possible combinations, only 76 were found in actual practice and even these may be arranged in certain basic clusters.

Recognition that the several parts of the body may exhibit different amounts of each component led Sheldon to study the body in five regions: 1) head, face, and neck; 2) thoracic trunk; 3) shoulders, arms, and hands; 4) abdominal trunk; 5) legs and feet. The sum of the regional assessments is then averaged to give the somatotype rating for the entire body.

The qualitative assessment of somatotyping is supplemented by a quantitative approach. Seventeen horizontal dimensions, some taken in the antero-posterior direction and others transversely, are measured directly on the photographic negative and expressed as percentage ratios of stature. (Stature and weight are obtained directly.) These seventeen indices, together with height $\sqrt[3]{\text{weight}}$, are used in conjunction with a series of tables which represent the distribution of the means for the 76 somatypes against the 18 anthropometric criteria.

Somatotyping may be done also by using only the measurements. A suitably designed machine expedites the task. Much less time is required, however, for somatotyping directly from photographs and adequately trained independent observers show a marked degree of agreement in their ratings.

The three components—endomorph, mesomorph, and ectomorph—are recognized by Sheldon as primary variables. Additionally, he categorizes other variables as belonging to second, third, etc. orders. The second order variables which he recognizes include dysplasia, gynandromorph, a textural aspect, and hirsutism. *Dysplasia*, used with different meaning than that given by Kretschmer, applies to disharmonious mixtures of the three primary components in different regions of the body. Measured in terms of differences among the somatotype ratings for the five regions of the body, the amount of total dysplasia is evaluated against a 7-point scale. *Gynandromorph* refers to the expression of secondary sex characteristics of the opposite sex and is rated, likewise, by means of a 7-point scale. The *textural* variable, which Sheldon usually terms the *t*-component, is in the nature of an aesthetic judgment as to “‘finesness’” or “‘coarseness’” of structure and contour. A 7-point scale is used to rate it. *Hirsutism*—or hairiness—of trunk, arms, and legs is rated by means of a 5-point scale.

In the *Varieties of Temperament* the thesis is affirmed that structure, size and shape somehow determine function—motor, physiological, and

mental—as well as influence reaction to pathological agents and conditions. Function, therefore, may be investigated at any one of several levels of manifestation.

Constitutional psychology seeks (vT) for the correlates between mental function and physique. For its goal, a basic taxonomy is required by which individuality may be denoted, classified, and scaled in order to account for most of the diversity of human differences. The taxonomy of structure was developed in *The Varieties of Human Physique*. That study of the size and shape of human beings comprises the *statics* of constitutional psychology. The *dynamics* embraces the study of temperament. "When structure takes on function, when man gets up and moves around, expressing his desires and motivations and interacting with his fellows, then he becomes a dynamic organism. And the study of his behavior in its more elemental manifestations is the part of dynamics called the science of temperament." (vT, p. 4.) From this viewpoint, physique and temperament are two facets of the same thing; hence, we may "expect that the dynamics of an individual should be related to the static picture he presents."

TABLE I
PRINCIPAL CHARACTERISTICS OF EACH SOMATOTYPE⁵

<i>Characteristic</i>	<i>Endomorphy</i>	<i>Mesomorphy</i>	<i>Ectomorphy</i>
Body, general	Round, soft contours; antero-posterior and transverse diameters about equal.	Square, hard contours; muscles prominent, massive; trans. diameters exceed ant.-post.	Linear, fragile, delicate; ant.-post. & trans. diameters reduced, trans. less reduced.
Concentration of mass	Abdomen and thorax predominate over extremities, abdomen over thorax, thigh over lower leg and upper arm over lower arm; rounding and "hamming" of thighs and upper arms; neck short.	Trunk large, but concentration not central; thoracic segment predominant over abdominal; distal (lower) limb segments heavy.	Mass decentralized; abdomen flat, short; thorax long relative to abdomen; neck long, slender.
Head	Large, almost spherical in pronounced endomorphy.	Size varies much; bones heavy, thick; ridges strong.	Slight, bosses common; ridges slight; occipital projection common; breadth predominantly narrow relative to length
Face	Wide; lower face breadth approximates that of upper face; soft, round.	Large relative to skull; long, broad massive, bony.	Small relative to skull; features fragile; triangular in frontal view.
Contours, general	Smooth, muscle relief lacking.	Sharp, high muscle relief, especially deltoid & trapezius.	Muscle relief lacking; supra-clavicular hollows; "winging" of scapulae.

5. From VHP, pp. 37-45.

<i>Characteristic</i>	<i>Endomorphy</i>	<i>Mesomorphy</i>	<i>Ectomorphy</i>
Limbs	Short, tapering; hands & feet small.	Length variable; wrist & hand large	Relatively long, especially in distal (lower) segment; weak thighs & upper arms; hands & feet long.
Bones	Small on palpation; cortex thin in x-ray.	Large, prominent; bones thick; ribs strong, heavy.	Small, delicate; ribs delicate, prominent; thin in x-ray.
Vertebral column	"S" curve weak, padded out.	Lumbar curve marked; buttocks prominent muscularity.	Lumbar curve flat, high; thoracic curve sharp, high.
Trunk	Relatively long; chest wide at base; maximum transverse breadth of body near iliac crest; waist high, slightly indicated; wide angle of ribs with sternum.	Thorax wide at apex; shoulders broad; waist slender; trunk long, upright; pelvis sturdy, hips broad; waist low; abdominal muscles strong, prominent.	Trunk short relatively; shoulder droop constant; acute angle of ribs with vertebrae.
Outer contour of thigh	Frontal and dorsal feminine-like.	Rugged, masculine.	Weak; relief scant or lacking.
Skin	Soft, smooth, velvety.	Thick, coarse; large pores; connective tissue heavy; wrinkling heavy, coarse.	Thin, dry; elastic & connective tissue scant; fine wrinkling early.
Hair	Quantity slight to medium; tendency to early baldness; pubic distribution pattern feminine.	Coarse; luxuriant to sparse; hair growth slow.	Fine; grows rapidly; baldness rare; pubic distribution variable.
Genitalia	Hypoplastic; undescended testes common.	Well-developed, compact.	Linear, relatively hypertrophic.

Temperament is defined (VT, p. 4) as "the level of personality just above physiological function and below acquired attitudes and beliefs. It is the level where the basic patterns of motivation manifest themselves."

Search among several hundred alleged traits of temperament for the criteria requisite for a taxonomy of temperament resulted eventually in the standardization of sixty traits. Use of correlation techniques in standardizing the sixty and in exploring their relationships revealed that they fall into three clusters of twenty each. The traits within each cluster correlate positively with each other and negatively with those of the other clusters. Collectively, these traits form the scale for assessing the seemingly three primary components of temperament.

Viscerotonia, the first component, is characterized in its extreme form by general relaxation; sociability; by love of physical comfort, food, the company of others, and for the affection and approval of

others. "The motivational organization is dominated by the gut and by the function of anabolism. . . . The digestive tract is king, and its welfare appears to define the primary purpose in life." (VT, p. 10.)

Somatonia, the term applied to the second component, is distinguished by muscular activity as revealed by vigorous assertiveness of posture and movement, "by aggressiveness, general noisiness, by the love to dominate and the lust for power." The organization of motives is dominated by the somatic muscular system. (VT, p. 26.)

Cerebrotonia, the third component, is marked by restraint in posture and movement, by inhibition, the desire for privacy, and by hyperattentiveness. The motivational organization appears to be antithetical to that of the other two components.

(Exaggerated manifestations of the components as revealed by maladaptive or inept behavior are termed, respectively: *viscerosis*, *somatosis*, *cerebrosis*. Similarly, *visceropenia*, *somatopenia*, and *cerebropenia* refer to deficiencies of viscerotonia, somatonia, and cerebrotonia).

The degree of each primary component present in an individual is rated against a 7-point scale, with 1 the minimum. The component values are then combined to give an index of temperament similar to the rating for a somatotype.

For 200 White college males the correlations between the two levels of personality (morphological and temperamental) were: endomorphy with viscerotonia, + .79, mesomorphy with somatonia, + .82; and ectomorphy with cerebrotonia, + .83. (VT, p. 401.) Thus the correlation between physique and temperament appears considerably higher than one might suspect. (In a sample of 260 young adult males attending Harvard University, Seltzer, Wells, and McTernan (1948) found 51—i.e., 19.6 per cent—dominantly ectomorphic and that for 84 per cent of the 51—a statistically significant result—the dominant trait of temperament was cerebrotonia.)

In his latest volume, *Varieties of Delinquent Youth*, Sheldon announces (p. 85): "The main purpose of this book is to contribute to a psychology adequate . . . to describe and interpret human temperaments [which] I think a main task in psychology." To further this purpose, he adds a psychiatric index to the methodological battery of constitutional psychology. The index is a concise expression for what psychiatrists commonly term the "'neurotic or psychoneurotic'" tendencies of an individual. (p. 86, 106.) Two orders of psychiatric delinquency are distinguished in the book (p. 106 ff) but are not clarified with respect to the index. The primary level is that of the psychoses

which necessitate institutional care; neither organic nor functional are specified. The secondary order is that of the psychoneuroses for which institutional care is not required.

The primary components of the index, which are rated against a 7-point scale, are: manic-depressive, paranoid, and heboid. The complete manic-depressive would have a psychiatric index of $\psi 7-1-1$ which would fall as nearly as possible to the 7-7-1 somatotype if there were such a somatotype. Such an individual would be so much over-endowed with viscerotonia and somatonia that it would be impossible to achieve any kind of effective or adaptive integration of his agitated impulses. (The symbol ψ is placed before the psychiatric index in order to distinguish this index from a somatotype rating.) The totally paranoid, characterized by $\psi 1-7-1$, coincides as nearly as possible with the hypothetical 1-7-7 somatotype. A person thus marked "would reach the extreme in aggressive energy and hyperawareness, but would be without affect, i. e., empathy or compassion, and without relaxability." (p. 60.) The $\psi 1-1-7$, or complete heboid, is as nearly as possible the counterpart of the hypothetical 7-1-7 somatotype. Such a person is mentally asthenic, the very antithesis of positive affirmation or projection, completely withdrawn and with a lack of both energy and motivation. The catatonic shows tendencies in the direction of each of the primary components.

The traits distinguishing each of the components were elaborated and tested with the cooperation of Dr. Phyllis Wittman at the Elgin, Illinois, state hospital. Psychiatric ratings were made by Wittman for each of 155 patients on the basis of the hospital records while somatotype ratings for them were made by Sheldon. Each observer separately submitted his data for statistical analysis at an independent statistical laboratory. The correlations appear in the following table (VDY, p. 69):

TABLE II
 "CORRELATIONS BETWEEN THE PRIMARY MORPHOLOGICAL
 COMPONENTS AND THE PSYCHIATRIC COMPONENTS:
 ELGIN STUDY
 (N = 155)

	Psychiatric Component I (Manic Depressive)	Psychiatric Component II (Paranoid)	Psychiatric Component III (Heboid)
Endomorphy	+ .54	— .04	— .25
Mesomorphy	+ .41	+ .57	— .68
Ectomorphy	— .59	— .34	+ .64

These "primary psychiatric components are our old friends the

primary components of temperament, but turned a little off their axes, so that each of the psychiatric components seems to be principally the consequence of a *failure* of one of the components found basic to general psychology." (p. 85) More formally, Sheldon's principal thesis in the development of the psychiatric index is: "That the reaction patterns on which the psychiatric index is based are part of a continuous multi-dimensional distribution of human behavior which embraces not only the whole range of maladaptive behavior but likewise the range of adaptive and superior behavior; that, therefore, the problem of psychiatric classification is part and parcel—one and the same—with the problem of general psychological classification." (p. 89.) This thesis demands (p. 85), "*that not only must psychiatry rest on a frame of reference common to general psychology, but so must any other discipline attempting to describe and interpret human beings in action* [italics by Sheldon]."

With the psychiatric index added to the battery of techniques for constitutional psychology, Sheldon advances on the problem of juvenile delinquency. The first objective is a study of delinquent youths at the Hayden Goodwill Inn, Boston, Massachusetts. The Inn is a privately supported institution intended and operated as a rehabilitation home for boys. Two hundred of these boys, chiefly White but a few Negro, for whom the data were most complete with respect to both length of time and adequacy of record were selected for individual and group report in the VDY. The sample does not include any boys suffering from specific and gross physical handicap. The IQ ratings, interview data on personal and familiar background (Sheldon's, that of the Inn and other welfare agencies as well as court and state correctional school records) were all drawn upon for data. The following table, abstracted from a more lengthy one, recapitulates Sheldon's principal findings:

TABLE III

MEANS OF VARIOUS RATINGS FOR THE PLATOONS AND FOR THE BATTALION OF HAYDEN GOODWILL IN DELINQUENT YOUTHS⁶

Predominant Weakness	Company	Platoon	N	Total D	IQ	MOP	Psychiatric 1st order	Psychiatric 2nd order	Primary criminality	Cerebrophobic
Mental insufficiency	A	1	36	6.9	2.9	1.3	0.4	1.2	0.4	0.4
Medical insufficiency	A	2	46	6.3	1.0	3.2	0.1	1.1	0.2	0.2
First Order Psychopathy	A	3	19	7.5	0.4	0.8	4.8	0	0.3	0.4
None; Chaplain's unit	B		5	0	0	0	0	0	0	0.0
Second Order Psychopathy	B	1	79	4.6	0.2	0.5	0	2.3	0.4	0.5
Primary Criminality	B	2	16	6.2	0.8	0.5	0	0.5	4.1	0.2
Means for the battalion			200	5.7	0.9	1.3	0.5	1.4	0.6	0.4

6. From Table 12, VDY, p. 727.

Predominant Weakness	Gynandrophrenic	Somato-type	Psychiatric Index	Stature (inches)	Primary \bar{t}	Secondary \bar{t}	General Strength	IQ Score
Mental insufficiency	0.2	3.6-4.5-2.5	2.7-1.7-1.4	68.3	2.3	2.1	3.0	76.6
Medical insufficiency	0.5	3.3-4.5-2.8	2.4-1.9-1.3	68.6	2.3	2.3	2.5	85.6
First Order Psychopathy	0.7	3.9-4.5-2.7	3.7-2.6-2.2	69.2	2.6	2.8	2.7	92.1
None; Chaplain's unit Second Order	0.0	3.0-4.9-2.8	1 -1 -1	69.4	3.2	3.4	3.6	111.6
Psychopathy	0.7	3.6-4.5-2.9	2.8-2.0-1.4	69.6	2.9	2.7	3.1	99.2
Primary Criminality	0.1	3.4-5.4-1.8	3.2-2.1-1.0	67.7	2.8	2.4	3.9	85.8
Means for the battalion	0.5	3.5-4.6-2.7	2.8-1.9-1.4	69.0	2.6	2.5	3.0	89.2

Several headings in Table III require definition: "Total D," i. e., total delinquency, represents the sum of the following seven scores: 1) IQ; 2) MOP; 3) first order psychiatric; 4) second order psychiatric; 5) cerebrophobia; 6) gynandrophrenia; 7) primary criminality. The individual items, except IQ, are rated against a scale of 1-10 with 10 designating a hopeless case.

1) "IQ:" The IQ's were standardized on scores for 16 year old males. The standardized ratings were then translated into a 5-point Index of Delinquency by means of a special conversion table in which 5 indicates maximal insufficiency.

2) "MOP:" medical insufficiency other than psychiatric, i. e., "any apparently lifelong organic deficiency resulting in permanent poor resistance to infection or impairment of some physiological function which is vital to development of an adequate personality." (VDY, p. 105) Briefly, MOP designates constitutional inferiority.

(3) "First order psychiatric:" delinquency at the psychotic level of behavioral inappropriateness, considered apart from or over and above insufficiency.

(4) "Second order psychiatric:" delinquency at the "psychoneurotic" level of behavioral ineptitude. "Psychotic" and "psychoneurotic" are here used with their conventional meanings and indicate merely levels of seriousness of inept ideation and behavior.

(5) "Cerebrophobia:" delinquency associated with inability to tolerate the third component of temperament, i. e., cerebrotonia, and with inability to tolerate depressants of that component; e. g., alcohol, etc.

(6) "Gynandrotrophic delinquency:" gynandrophrenic behavior (i. e., behavior characteristic of the opposite sex) with consequences serious for the individual and others.

(7) "Primary criminality:" "persistent misbehavior without any evidence of a condoning insufficiency or of clinically recognized psychiatric pathology." (VDY, p. 105)

"Primary *t*:" Aesthetic symmetry of structure and contour as revealed in somatotype photograph (VDY, p. 22)

"Secondary *t*:" aesthetic qualities of facial features, hair, and pigmentation as well as structure of hands and feet as judged by personal inspection. A 5-point rating scale was used for these judgments, with 1 minimal. The 7-point scale used in VT is more precise. With the latter scale, the general American public averages ca. 1.8 which corresponds to 3 on the 5-point scale. (VDY, p. 756)

"General strength:" estimate of total muscular power of individual; expressed by 5-point scale. Mean of 3.0 for the HGI sample equals the assumed mean for the population at large.

The general characteristics of the HGI delinquents may be gleaned from Table III, p. 53. The somatotype is predominantly mesomorphic with moderate endomorphy and slight ectomorphy. The somatotype differs (VDY, pp. 726-730) from that of Sheldon's 4,000 college men in that the distribution of the somatotypes of the college group approximates more nearly a normal curve while the HGI somatotypes are concentrated chiefly within the endomorphic mesomorph range. Striking is the marked mesomorphy of the "primary criminality" group of 16 boys (Company B, Platoon 2). The mean psychiatric index for the entire group indicates (p. 746) a mild degree of psychoneurotic behavior. With respect to this character, the "primary criminality" group is outranked only by the first-order psychopaths (Company A, Platoon 3) in the first, i. e., manic-depressive, component of the index. The psychoneurotic behavior of the "primary criminality" group is exclusively of the second order; their IQ is 85.8, i. e., dull.

Sheldon's studies have had a varied reception. In a rigorous article, Meredith (1940) censures the "seemingly ambiguous terminology, the confused inference, the needlessly indefinite statement" and comments that "the procedures involve repeated oscillation from observation to rationale, from description to assumption, from findings to theory." A conspicuous shift of rationale from structure to function is noted by Meredith (pp. 304-305) when Sheldon and his associates interpret "'conspicuous laying on of fat'" as an expression of endomorphy. "It is not claimed that subcutaneous tissue is a structural derivative of embryonic endoderm, but the claim is made that fat-deposit is an 'indication of predominance of the absorptive functions of the gut (p. 34). Have Sheldon and his collaborators overlooked that by the same rationale the absorptive functions of the gut are also basic in the production of *mesomorphy*, with its 'large bones, big joints, and heavy muscles' (p. 32)?" The theoretical framework was assailed by

Andrews (1941) also. The inadequacies of Sheldon's hypothesis of the dominance of the somatotype by one or another of the embryonic germ layers, or the existence of a balance among such, have been described by Hunt (1949).

More enthusiasm has been shown by Hooton (1940, 1946) who, nevertheless, has suggested (1940, pp. 216-219) that the scale for rating components be reduced from seven to five points, and notes that race, sex, and age factors have received inadequate consideration in the somatotyping technique. These lacks had been recognized by Sheldon.

Deficiencies in systematization beset Shaplin (1942) when he tried to apply the somatotyping technique as described in VHP. He found his efforts hampered by: "1. Lack of standardization of values; 2. Problem of establishing personal standards through observational experience; 3. Need for means of body build description without photos when desirable; 4. Problems of stature and gross size." Similar difficulties with systematization led Bellak and Holt (1948), who somatotyped a sample of deceased psychotics, to declare: "To have studied with the originator of the technique and to have tried conscientiously to follow the book is not enough to enable one to apply it to subjects who differ appreciably from those Sheldon used and end up confident that the results are not a function of errors in method." They urge normative studies with respect to sex, age, ethnic, and socio-economic factors.

Many persons may discover objections similar to the foregoing in the last publications.

Despite some adverse comment the somatotyping technique continues in use, either alone or in combination with other techniques. Thus, Draper, Dupertuis, and Caughey (1944, p. 143) find that:

"While it is probably not possible to make a completely accurate study of human morphology, a fair approximation can be made with the three methods now employed in the Constitution Clinic. Direct measurement of the body (*anthropometry*) indicates the size and proportions of the bony skeleton. The *somatotype* describes soft part relationships and body contours. And, finally, *observation of non-measurable characters* throughout the body discloses many details of design which may be associated with faulty growth and development and which so subtly reveal the distinctive quality of the individual's total being." (Italics added.)

The clearly formulated problem which Damon (1946) investigated was that of the relationship between *physique and successful military flying*. Any physical traits consistently associated with success in training and combat were to be discovered and, if the associations were positive, their strength was to be determined as well as the scopometric

(measurement and observation) techniques most likely to reveal them. Four groups, in terms of flying achievement, were compared: (1) non-flyers, from which aviators were drawn; (2) beginning flyers; (3) recent graduates; (4) successful combat flyers. Additionally, graduate bomber pilots and co-pilots graduates, thus classified chiefly because of training performance and qualities of leadership, were compared. Physique analysis involved three procedures: standard anthropometry; Seltzer's disproportions of body ratios and Sheldon's somatotyping.

The data comprised measurements and observational ratings on 3,675 men, made by one observer, and were supplemented by additional series drawn from the literature. The 3,675 subjects were distributed among the following groups: (1) two college series—one Harvard and one Chicago; (2) one group of AAF ground troops, "representing" the non-flying personnel from which flight officers and gunners, respectively, were obtained; (3) aviation cadets; (4) aerial gunner trainees; (5) graduate flying officers; (6) graduate gunners; (7) "returnee" bomber and fighter pilots with 10 or more combat missions.

The results obtained reflect the procedures used. *Anthropometry* revealed some pronounced and consistent differences. Chest circumference was found to increase regularly and significantly from non-flyers to flyers, from cadets to graduate flyers, and thence to successful combat pilots. Significant increase at each stage was shown also for chest circumference relative to stature and head circumference. Thus, as chest circumference/stature increased, head circumference/chest circumference decreased, and the percentage of disproportion in each index (i. e., beyond the critical value found by Seltzer for another sample) decreased constantly with success in military flying. In *somatotype*, mesomorphy—in mean amount as a separate component and in percentage of dominance over endomorphy and mesomorphy—increased steadily while gynandromorphy (feminoid traits) decreased progressively; both mesomorphy and gynandromorphy decreased in variability from stage to stage in flying achievement. *Qualitative morphology* yielded mostly negative results. The notable exception was greater muscle tonus of successful combat pilots in comparison with cadets and gunner trainees. No differences were found for hair color or hair form. Returnee flyers possessed more pure light eyes than novice flyers, and returnee fighter pilots had the fewest pure dark eyes of any group. Vascularity (blood in surface tissue) and skin color differed more between bomber and fighter pilots than between cadets and returnees; however, returnees had fewer brunet skins and slightly less vascularity than cadets.

Group differences, in general, revealed physique as larger at each of the four stages, as more mesomorphic and masculine, with fewer disproportions, and less variability at each successive stage. The most marked differences between adjacent groups were between non-flyers and flyers, while successful combat pilots differed pronouncedly from college students, but less distinctly from cadets.

Some *socio-economic differentiation* of successful combat flyers was discovered, notably in national extraction (less mixed ancestry and more Old Americans), in education, occupation, and marital status. Traits in which all flyers apparently differed from non-flyers, but which did not differ between cadets and returnees, were the basis of induction (flyers had higher ratio of volunteers to draftees than did Army at large), and birthplace within United States (excess representation of West South Central states).

Multiple factorial analysis of body build represents a more strictly mathematical methodology than the others hitherto discussed. Utilizing a series of 12 measurements taken on adult males (Hammond's data), Thurstone (1946) found four primary factors: head size; bone length; transverse measures or girth; and size of extremities. With a series of 17 measurements on another sample of adult males (Rees and Eysenck's data), Thurstone (1947) demonstrated seven primary factors: chest width; limb length; trunk size; size, generally; bicristal (hip) width, provisionally; chest depth; and hand length, tentatively. The second study supports the first and indicates the probable utility of factorial analysis of body dimensions. An analysis of Sheldon's photometric data, made by Waldrop (Krogman, 1941) disclosed three primary factors: general size; a size factor for arm, neck, and chest; and another for leg breadths. Before attempting investigation of the relation between body-build and temperament, Thurstone suggests it would be advantageous probably to identify the primary factors in body growth. Both interest and practical importance lie in whether any primary factor(s) are related to temperament. Growth data have been subjected to factorial analysis by McCloy, Marshall, and Mullen, respectively.

Factors which influence or are involved in the *interpretation* of body build include age, sex, and race or stock, physical activity (exercise or work), and mentality and personality.

The stability of body-build with *age* involves both child and adult. In VHT, Sheldon held that the somatotype is permanent and probably can be determined at least as early as the sixth year or earlier. Some doubt of this has been voiced. A change in weight during a psychosis

sufficient to shift a leptosome or an athletic physique to that of a pyknic had been noted by Wertheimer and Hesketh (1926). In a study of body build in schizophrenic males, Gray and Ayres (1939) found nose breadth, chest circumference, antero-posterior and transverse chest measurements and dimensions relative to height to be significantly larger in the 40-60 year old than in the 20-40 year old group. The effects of a European type of famine diet on the somatotypes of 34 conscientious objectors were such as to decrease (Lasker, 1947) the mean somatotype values, based on observational ratings of photographs, as follows: endomorphy 49.4 per cent, mesomorphy 25.2 per cent, ectomorphy 66.7 per cent. In some individuals, the alteration involved a shift in dominance from one component to another. The distribution of the somatotype ratings for a sample of 33 adolescent boys (mean age ca. 14.5 years) at an Eastern "prep" school were found by Seltzer and Gallagher (1946) to differ little from those for Sheldon's 4,000 college men and for Dupertuis' 1,000 Harvard freshmen. The healthy, satisfactorily growing child, after the age of about 6 years, Wetzel declares (1948), shows very little fluctuation in body-build during his entire growth period. Adequate standards for assessing the somatotype of children have not yet been developed; hence, stability of the somatotype during the entire growing period remains to be demonstrated. In his recent review of the question of stability (VDY, pp. 33-40) Sheldon indicates that the hereditarily determined "morphogenotype"—subject to some change by nutritional, physical activity, and pathological factors—yields the somatotype; however, he apparently considers that the dominant component remains the same. The implication of the foregoing is that the body build of the individual, even when free from pathological influences, exhibits some variation; hence, it is necessary to determine the range of variability of the somatotype—probably around a recognized dominant component.

The effect of *sex* on somatotype had been declared by Sheldon (VHP, p. 66) to result in endomorphy as well as a strong endomorphy and ectomorphy being more frequent in women while mesomorphy as well as a strong endomorphy and mesomorphy are more common in men. At the time, his findings were tentative because based on bromide silhouettes of 2,500 women. Except for the mesomorphic component these findings are contrary to those for 175 Radcliffe college women whom Bullen and Hardy (1946) found to be slightly less endomorphic and slightly less ectomorphic than Sheldon's 4,000 college males. For a sample of 159 girls from a midwestern college, Racher (1948) found the amounts of endomorphy and mesomorphy, in the order

named, exceeded that for ectomorphy. These girls, contrary to Sheldon's statement concerning women generally (VHP, p. 66) are mesomorphic endomorphs—not ectomorphic endomorphs. The somatotype ratings for a number of disease groups observed at Presbyterian Hospital, N. Y. C. (Draper, Dupertuis, and Caughey, 1944), agree with Sheldon's findings that women are more endomorphic and less mesomorphic than men; however, in this disease sample, the men exceed the women in ectomorphy. In a study of female obesity, Angel (1949, pp. 444, 451) found endomorphy conspicuously dominant and ectomorphy minimal, the somatotype being mesomorphic endomorph. Direct measurements and morphological observation indicated that these women retained slightly juvenile proportions and morphological traits.

Interpretation of adult somatotype in terms of growth stage has been ventured by Hunt (1949) who suggests that endomorphy represents the "infantile" component of physique (characterized by large liver and digestive tract and considerable subcutaneous fat); ectomorphy, dominance of the juvenile component (enlargement of the neural system to approximate adult size; slow growth of heart, kidney, and gonads; relative decrease in subcutaneous fat); mesomorphy, exaggeration of the adolescent component (dominance of muscle and bone). Transient shifts toward gynandromorphy frequently occur in either sex as the secondary sex traits begin to develop. Environment and heredity probably affect duration and retention of these various stages. Alternatively, Hunt suggests that endomorphy may result from "a steep proximo-distal growth gradient which exaggerates central rather than peripheral growth" while "ectomorphy may be the product of a steep cephalo-caudal growth gradient which yields a full-sized head on a puny body."

The changes of the growing, developing child in linear measurements and proportions—such as shoulder-hip dimensions and trunk length-stature measurements—which culminate in the adult male or female size and proportion, have an extensive literature. A brief survey of these and other changes appears in Bayley and Tuddenham (1944) and Stuart (1946), and need not be recapitulated here.

Physical stock may be considered another factor in body build. With the three-fold distribution of height and then of weight within the height categories which he used, Hooton (CM, pp. 336-337) found among Negroes the typical body builds, other than the prevailing medium-medium class, were medium-height-heavy and short-medium weight. In the Negroids, medium height-heavy is more frequent though

still second and short-medium is an even less frequent third. Among the Old Americans, medium height-heavy was second while medium height-slender and tall-medium, each with about the same frequency, were in third place. Among the purer Negroes, short stature and heavy weight were more stressed; in the Negroids, medium stature and heavy weight; and in the Whites, tall stature and medium stature with slender build. In the 200 youths of the HGI series were a few Negroes and Negroids; however, Sheldon (VDY) makes no comment about somatotype differences between them and the Whites. Both linear (leptosome) and lateral (eurysome) body builds, Weidenreich (1946) concluded, occur in all races though in different proportions. Socio-economic level, occupation, etc. must be considered in sampling for the race factor in body build.

Body-build as related to *physical activity*—such as athletics or work—has been investigated variously. The degree of “masculine fitness,” i. e., muscularity and ruggedness characteristic of male in comparison with female, was found by Seltzer and Brouha (1943) to be related to fitness for hard work both before and after training: the stronger the “masculine component,” the greater the degree of physical fitness. Previously, Seltzer (1946) had found little association between body-build (as revealed by height, weight, chest circumference, and leg length) and a physical fitness index involving step, pack, and treadmill tests. In studies of physical fitness, he concluded emphasis should be placed on the total physique and less on the component parts. For description of the total physique, he recommends somatotyping because of its practical advantages. (A similar opinion has been expressed by Damon (1946).) Strength in boys Jones (1947) discovered to be related both to body size, especially weight, and to the mesomorphic component of body build. Mesomorphy was found to have little or no relation to weight and to have a negative correlation with height. Earlier, Cureton (1941-1947) had demonstrated that increase in muscular girth, consequent to exercise, is greater among those of athletic (mesomorphic) build than among those of linear (ectomorphic) physique. Success in military flying has been shown by Damon (1947) to be associated with increased mesomorphy, decreased feminoid characteristics as well as with increased chest circumference and chest circumference/stature index, and with decreased head circumference/chest circumference and decrease in percentage of disproportion of each index.

The relation of *mentality* and *personality* to physique has been noted in several places in preceding pages. One of the most significant studies

of those yet to be considered is Seltzer's (1946) "Body disproportions and dominant personality traits." Based on a sample of 258 Harvard undergraduates, selected for general "soundness" of personality the majority of whom were first observed during their sophomore year, the results indicate an association between limited ranges of body ratios termed "disproportions" and the frequency of certain prevailing personality traits. The disproportions comprise: stature tall for body weight; shoulders broad for circumference of chest; chest narrow for width of shoulders; chest shallow (front to back) for width of shoulders; hips broad for width of shoulders; heads large for size of chest; chest small for stature; leg circumferences small for width of shoulders; faces broad for width of chest; hands large for body weight; and hips broad for width of chest. Individuals with those disproportions had a greater number of those dominant personality characteristics which reveal less stability, less integration, more sensitivity and complexity of personality, and less capability to make easy social adjustments. Among the traits which accompany the disproportions are: "unstable autonomic functions, less well-integrated"; 'mood fluctuations'; 'bland affect'; 'inhibited'; 'cultural'; 'lack of purpose and values'; 'inarticulate'; and 'asocial.'" On the other hand, individuals having traits which indicate "soundness"—stability, integration, vitality, and strength of personality—possess fewer physical disproportions than the average of the total sample. These generalizations were tested on a group of 51 undergraduates who had been referred to the psychiatric clinic, and 300 unselected Harvard freshmen. In both samples, the disproportions were more numerous in the "less sound" undergraduates and in the psychiatric referrals. Seltzer ends with the suggestion—subject to check on other groups, other age levels, and in differing cultural milieux—that the disproportions are constitutional and may point toward a genetic factor in the determination of personality and behavior.

In another study, "Sheldonian somatotype and psychotype" (Seltzer, Wells, and McTernan, 1948), Seltzer somatotyped the same 258 (or 260) subjects used in the "disproportions" project while McTernan, who had nothing to do with the somatotyping, made the psychotype (i. e., temperament) classifications. In this independent analysis, the authors found a marked association between dominant ectomorphy and dominant cerebrotonia. They hazard the suggestion that at lower levels of cerebrotonia and ectomorphy, the relationship between the two traits may be less close and perhaps, obscure.

Upon considering the relation of growth, somatotype, and tempera-

ment, Hunt (1949) submits that in our Western culture cerebrotonia may be the temperament of later childhood, viscerotonia that of infancy, and somatotonia that of adolescence. Probably these tendencies are culturally modifiable. In his study of female obesity, Angel (1949, p. 459) expresses a somewhat similar conclusion: "The personalities of the obese seem simply to become fixed or partly fixed at too early a growth stage, in fact at the oral stage of development of the Freudian school. If this personality distinction is in any way genetically conditioned (through post-pubertal rapid slowing of growth, etc.) it would make child-like dependence on the approval of others, love of eating, and increased appetite more exposed than usual to exaggeration through social difficulties and training."

Mental abnormality, Draper stated (1941), occurs in about 2% of the general population while approximately 1/4-1/3 of criminality is due to the mentally abnormal. This association is important in view of the relation between physique and personality or mentality which has been noted at various places in the preceding pages. The finding by Hooton that the criminally insane have a poorer physique than the civil insane or the sane criminals is illustrative. Other studies indicate an association between specific mental abnormality and body build.

An anthropometric study of 100 White male psychotics by Father Connolly (1939), with the psychoses independently classified by Moore, showed that the paranoid schizophrenes differed from the other schizophrenes (simple, hebephrenic, and catatonic). Instead they resembled the manic-depressives, but were more robust (athletosome, mesomorphic) in arms and legs and were even more pyknic. The other schizophrenes were preponderantly leptosome (ectomorphic). The manic-depressives had a greater mean age than the other groups, but the differences between the manic-depressives and the other groups were not affected when classes of equal age were compared. The physique of the paranoid schizophrenes differed so greatly from that of other schizophrenes that no support was found for Kretschmer's teaching of positive association between leptosome and athletic types with schizophrenia.

A totally independent study by Gray (1939; note year) on body-build in 328 Illinois schizophrenes, divided into four psychotic groups by an institutional psychiatrist, revealed that the paranoid schizophrenes were more pyknic-like than were the other schizophrenes. Catatonic schizophrenes Gray found to be like schizophrenes as a whole; simple schizophrenes differed only in being more dolichocephalic (long-headed relative to breadth); and hebephrenics only in having a narrow chest.

The total schizophrenic sample when compared with Illinois convicts, (in same general environment and assumed as approximation toward normal) with age-classes equal, differed significantly in 79 percent of 42 metric and indicial characters. In about half of the traits (*viz.*, weight, stature, various trunk measurements and percent relation of these to stature) the schizophrenes were smaller. In the other half, the schizophrenes were larger (various head measurements and indices as well as pelvic breadth/stature, hip breadth; shoulder breadth, and chest front-to-back/chest transverse). Both the schizophrenes and a sample of breadth/shoulder 100 manic depressives, observed by ray, differed from the convict sample in having a smaller sitting height/stature (*i. e.*, more eunuchoid), and narrower chest; however, a larger head, greater pelvic breadth—absolutely and relatively to stature, a deeper chest (front-to-back/transverse), and a more feminine hip breadth/shoulder breadth). The total schizophrenic group compared by age classes with the manic-depressives were smaller in 16 items (weight, stature, chest measurements, shoulder breadth, nose height, and relation of foregoing to stature; and a flatter chest). In 10 items, the schizophrenes were larger (head and face dimensions, likewise relation of these to stature; longer face; and more feminine trunk—hip breadth/shoulder breadth). Both psychotic samples show abnormally broad pelves when compared with convicts, but the schizophrenics are less abnormal in this respect.

The data in the foregoing paragraph have been given in some detail because they agree with Connolly's finding about the pyknic semblance of the schizophrenic paranoids and with Hooton's statements concerning the poor physique of the psychotics. Gray's data, with one exception, are from Illinois, a state not included in Hooton's survey; the manic-depressive patients are from Illinois and California. It needs be emphasized that in noting these associations, causation is not implied.

The physique of 97 Old American adult female morons from four northeast Atlantic coastal states was analyzed anthropometrically by Damon (1941). Comparison with four normal series of like sex, age, and race showed the morons smaller in most body measurements, especially the long ones such as stature and sitting height; weight, too, was less. Inspectionally, several morphological aberrations were found in the moron series. Linear body build prevailed over lateral in the moron sample.

The body build of 400 male White drug addicts (at Ft. Leavenworth prison)—a group often characterized as temperamentally abnormal—was found by Brown (1940), using metric and inspectional criteria, to

be within the normal range but predominantly athletic with a trend toward the pyknoid end of the distribution.

The "relation of somatotypes to dementia praecox," studied from post-mortem photos of 50 DP's and 33 paresis subjects used for control, disclosed (Bellak and Holton, 1948) no significant difference between the two psychoses. Both were mesomorphic ectomorphs; hence, differed from Sheldon's 4,000 college men for whom the component means were about equal. Why the two psychotic groups did not differ in somatotype from each other remains conjectural. The authors do not give any indication of the schizophrenic types which presumably were present. An increase in endomorphy with age parallels Gray's (1939b) finding that schizophrenic patients of the 40-60 year old class were larger in several trunk dimensions than the 20-40 year group.

PRESENT FINDINGS

Somewhat conflicting results have been obtained from American studies of constitutional factors in crime. Considerable disagreement was found by Mohr and Gundlach (1927, 1929-1930), when applying Kretschmer's typology, between the subjectively determined types of body-build and the objective measurements of the body. Among the men for whom agreement existed, a greater proportion of asthenic and athletic types than of pyknic were convicted of burglary, robbery, and larceny while a greater proportion of pyknic than of asthenic and athletic types were incarcerated for fraud, violence, and sex offenses. Mental characteristics were found not to follow Kretschmer's specifications. Both mental and physical traits displayed a general progression rather than falling into definite types.

Determination of categories of body-build, by means of anthropometric methods, among Illinois adult male prisoners was found by Gray (1934) to be seriously affected by age; hence, he recommended that adults be considered in separate age groups.

The principal survey—that made by Hooton (1939)—disclosed the physical characteristics of criminals as differing significantly from those of non-criminals, chiefly in lesser size and certain indices as well as various non-metric, "morphological" characters. By virtue of these differences from the civilian population, the criminal is deemed biologically inferior and the author maintains that crime can be eliminated only by "extirpation of the physically, mentally, and morally unfit, or by their complete segregation in a socially aseptic environment." The

prepotent cause of biological inferiority, Hooton hypothesizes, is heredity. The Scotch verdict, "Not proven," rendered by critics of Hooton's report was based on: 1) inadequacy of statistical procedures—especially sampling; 2) on the lack of independent evidence of the criteria of inequality; and 3) on some of the apparent fallacious or inconsistent reasoning.

The other chief study (Sheldon's) is somewhat broader than Hooton's in that psychological and sociological factors receive more intensive consideration, but ends with a similar, though more discursively phrased, conclusion. Thus, Sheldon (VDY, pp. 752, 757, 759) sees delinquent behavior as ultimately consequent to irresponsible reproduction. Sheldon's Hayden Goodwill Inn series are endomorphic mesomorphs and about average stature; hence, to the reader of both reports, his and Hooton's, seem physically superior in general to the criminals of Hooton's series. The latter in this respect resemble Goring's English convicts while Sheldon's series are more like Mohr and Gundlach's (1929) Illinois convicts who were found more athletosome (mesomorphic); likewise, the drug addict series described by Brown (1940). The HGI youths with the lowest t —i. e., *quality* of physique as revealed by harmonious structure: size, proportion, contour, freedom from blemish, and smoothness of surface texture—"present primarily insufficiency and not primarily criminality." Sheldon does not specify, but presumably all of the youths, except those of the "chaplain's unit" (Table III, p. 53), have low t ratings. In addition to this, those grouped as either "mental insufficiency" or as "medical insufficiency" are handicapped by high ratings in IQ and MOP indices. Except the "chaplain's unit," all have a less than normal rating in the conventional IQ. Those boys, then, with the low t rating present morphological disharmonies which may be similar, in part, to the stigmata⁷ of biological inferiority which Hooton found in his series. "The spoor of insufficiency," Sheldon thinks, may be what Hooton saw in the penitentiaries rather than any such thing as criminality. The latter, Sheldon suspects, may not exist. Instead, human insufficiency exists and, far too frequently, eventuates in anti-social behavior of some nature. "The problem of crime control," Sheldon concludes, is focused "unequivocally on the practical matter of selective breeding." In the "Epilogue," Sheldon indicates the decisive, if not transcendent, importance of economic and socio-political factors—including population pressures—within a time-space framework. The time is so short since Sheldon's study of

7. Such as long, thin necks with sloping shoulders.

delinquent youth was published that definitive reviews have not yet appeared.⁸

Findings such as those of Hooton, Sheldon, and others may be examined against a broader background of physique and behavior. The obverse facet of constitution and crime is presented by physique and achievement in military flying. Group differences for the personnel at four successively higher levels of flying achievement shows (Damon 1946) an increase in physique, increased masculinity (i. e., fewer characteristics of the opposite sex), fewer disproportions in body ratios, and less variability at each successive stage. The study of "body disproportions and dominant personality traits" reveal (Seltzer, 1946) an association between limited ranges of body proportions, designated as "disproportions," and the frequency of certain predominant personality traits. Individuals with those disproportions manifest a greater number of those dominant personality traits which betray less stability, poorer integration, greater sensitivity and complexity of personality, and less ability to make easy social adjustments. On the other hand, those individuals with fewer physical disproportions than the average, have personality characteristics which indicate "soundness," i. e., stability, integration, vitality, and strength of purpose. Another study, that of Cabot (1938) of the relation of physique in adolescent boys to personality traits, disclosed the athletosome (mesomorph) as superior to the average leptosome (ectomorph) and to the pyknosome in psycho-social characteristics. In summary, then, "socio-sthenic traits and personality characteristics are associated [in all probability] with biologically 'good' physique." (Cabot, 1938) Conversely, one may hypothesize that individuals with traits indicative of less "sound" personality frequently will also be characterized by poor physiques or by a number of bodily disproportions.

The question of why one sample of criminals should be characterized by an athletic build and another by an asthenic (leptosome) physique may be due to any one or more of several factors which only careful sampling and investigation may be expected to reveal.

Present knowledge of growth and development suggest that many of the examples of poor physique which characterize a prison population as a group—not all members, by any means—are the result of growth failure. For much of this failure, current evidence indicates that insufficient nourishment, malnourishment, even psychic factors and lack of

⁸. This paper submitted Feb., 1950, for the International Congress of Criminology, Paris, Sept., 1950. For reviews of vdy, see Garn, S. M. *Am. J. Phys. Anthropol.*, 8(1):130-133, Mar., 1950. Jensen, H. E. *Social Forces*, 29:105, Oct., 1950. Reckless, W. C. *Am. J. Soc.*, 56:124, June, 1950.

exercise are responsible. The matter of timing when these ingredients requisite to satisfactory growth should be available and utilized needs be stressed. The role of poor heredity cannot be minimized, since there is, at least, experimental evidence of its influence; neither may the role be over-played as Hooton does.

Sufficient interest yet remains concerning the influence of biological factors in the etiology of crime that Reckless (1943, p. 162) was led to recommend Hooton's data be audited and the study partly redone in order to check and validate its findings. Plainly envisaged in this recommendation are adequate sampling and other statistical techniques. Any new large scale studies should be preceded by a "pilot" study in order to check sampling and various techniques of collecting data. Additional fields of enquiry, such as nutrition and genetics, should be included in any new undertaking. The method of studying physique should certainly utilize the techniques of anthropometry (including indices of disproportion), somatotyping, and inspectional assessment of individual morphological traits.

"... we are that bold and adventurous piece of nature, which he that studies wisely learns in a compendium, what others labour at in a divided piece and endless volume."

—SIR THOMAS BROWNE, *ca.* 1635

LITERATURE CITED

- ANGEL, J. LAWRENCE. 1949. *Constitution in female obesity*. AM. J. PHYS. ANTHROP., n. s., 7(3): 433-468.
- ANDREWS, JAMES M. 1941. *Review of "The Varieties of Human Physique."* AM. ANTHROP., 43(3): 470-474.
1943. *Evolutionary trends in body build. "Studies in the anthropology of Oceania and Asia presented in memory of Roland Burrage Dixon."* PAPERS PEABODY MUS. AM. ARCH. AND ETHNOL., HARVARD UNIVERSITY, 20: 102-121.
- BAUER, JULIUS. 1945. *CONSTITUTION AND DISEASE: Applied Constitutional Pathology*, 2nd ed. N. Y.: Grune and Stratton.
- BAYLEY, NANCY, AND TUDDENHAM, READ D. 1944. *ADOLESCENT CHANGES IN BODY BUILD*. Ch. III in *THE FORTY-THIRD YEARBOOK OF THE NATIONAL SOCIETY FOR THE STUDY OF EDUCATION*, Part I, *ADOLESCENCE*. Edited by Nelson B. Henry. Chicago: NATIONAL SOCIETY FOR THE STUDY OF EDUCATION (University of Chicago Press).
- BELLAK, LEOPOLD, AND HOLT, ROBT. R. 1948. *Somatotypes in relation to dementia praecox*. AM. J. PSYCHIAT., 104(11): 713-724.
- BINNING, GRIFFITH. 1948. *"Peace be on thy house."* HEALTH, CANADA'S NATIONAL HEALTH MAGAZINE, Mar.-Apr., 1948.
- BOWLES, GORDON T. 1932. *NEW TYPES OF OLD AMERICANS AT HARVARD AND EASTERN WOMEN'S COLLEGES*. Cambridge: Harvard U. Press.
- BROWN, RALPH R. 1940. *Relation of body build to drug addiction*. *Public Health Reports* (U. S. Pub. Health Service), 55: 1954-1963.
- BULLEN, ADELAIDE K., AND HARDY, HARRIET L. 1946. *Analysis of body build photographs of 175 college women*. AM. J. PHYS. ANTHROP., n. s., 4(1): 37-65.
- CABOT, P. S. DE Q. 1938. *The relationship between characteristics of personality and physique in adolescents*. GENETIC PSYCHOL. MONOG. 20(1): 20-120.
- COHEN, MILTON B., AND ABRAM, LEWIS E. 1948. *Growth patterns of allergic children*. J. OF ALLERGY, 19(3): 165-171.
- CONNOLLY, C. J. 1939. *Physique in relation to psychosis*. STUDIES IN PSYCHOL. AND PSYCHIAT. (Wash.: Catholic U. of Am. Press), 4(5): 1-24.

- CURETON, T. K. 1941. BODY BUILD AS A FRAMEWORK OF REFERENCE FOR INTERPRETING PHYSICAL FITNESS AND ATHLETIC PERFORMANCE. *Research Q'tly.*, 12:301-330.
1947. PHYSICAL FITNESS APPRAISAL AND GUIDANCE. St. Louis: C. V. Mosby Co.
- DAMON, ALBERT. 1941. *Physique in hereditary mental defects*. HUMAN BIOL., 13(4): 459-472;
1946. *Physique and achievement in military flying* (approx. title). Unpublished Ph. D. dissertation, Committee on Human Development, U. of Chicago.
- DRAPER, GEORGE, DUPERTUIS, C. W., AND CAUGHEY, J. L. 1944. HUMAN CONSTITUTION IN CLINICAL MEDICINE. N. Y.: Paul B. Hoeber.
- DRAPER, PAUL A. 1939. *Mental abnormality in relation to crime*. AM. J. MED. JURIS., 2: 161-165.
- GATES, R. RUGGLES. 1946. *Human Genetics*. Vol. II. N. Y.: Macmillan C.
- GOLDSTEIN, MARCUS S. 1943. *Demographic and bodily changes in descendants of Mexican Immigrants*. INSTITUTE OF LATIN AMERICAN STUDIES, U. of Texas.
- GRAY, HORACE. 1934. *Body build in Illinois convicts with special reference to age*. J. CRIM. LAW AND CRIMINOL., 25(4): 554-575;
1939. *Body build and diagnosis of schizophrenia*. HUMAN BIOL., 11(3): 357-368.
- GRAY, HORACE, AND AYRES, JAMES G. 1939. *Body build in schizophrenia with special regard to age*. ARCH. OF NEUROL. AND PSYCHIAT., 41: 269-276.
- HOOTON, EARNEST A. 1939a. THE AMERICAN CRIMINAL, Vol. I. Cambridge: Harvard U. Press;
- 1939b. CRIME AND THE MAN. Cambridge: Harvard U. Press;
1940. WHY MEN BEHAVE LIKE APES AND VICE VERSA. Princeton: Princeton U. Press;
1946. UP FROM THE APE. 2nd ed. N. Y.: Macmillan Co.
- HUNT, EDWARD E., JR., 1949. *A note on growth, somatotype, and temperament*. *Am. J. Phys. Anthropol.*, n. s., 7(1): 79-89.
- JONES, HAROLD E. 1947. *The relationship of strength to physique*. AM. J. PHYS. ANTHROP., n. s., 5(1): 29-39.
- KILMER, T. W. 1932. *A study of the human ear from the standpoint of identification and criminology*. CORRECTION (N. Y. State Dept. of Correction), 2: 12.
- KROGMAN, WILTON M. 1941. *Constitutional types*. CIBA SYMPOSIA, 3(9): 1058-1087.
- LASKER, GABRIEL W. 1947. *The effects of partial starvation on somatotype*. AM. J. PHYS. ANTHROP., n. s., 5(3): 323-342.
- LESSA, WM. A. 1943. *An appraisal of constitutional typologies*. AM. ANTHROP. ASSOC., MEM. 62: 1-96.
- LITMAN, NEIL N., AND BOSMA, JAMES F., 1948. *A preliminary report on the association of growth failure and poliomyelitis*. THE JOURNAL-LANCET (Minneapolis), 68(5):185-187.
- LITTLE, C. C. 1947. *Parental influence. Growth and individuality*. Ch. III-IV in MULLER, H. J., LITTLE, C. C., AND SNYDER, LAURENCE H. GENETICS, MEDICINE, AND MAN. Ithaca: Cornell U. Press.
- MEREDITH, HOWARD V. 1940. *Comments on "The Varieties of Human Physique."* CHILD DEVELOPMENT, 11: 301-309.
- MEREDITH, HOWARD V., AND MEREDITH, E. MATILDA. 1944. *The stature of Toronto children a half century ago and today*. HUMAN BIOL., 16(2): 126-131.
- MERTON, ROBERT, AND ASHLEY-MONTAGU, M. F. 1940. *Crime and the anthropologist*. AM. ANTHROP., 42(3): 385-408.
- MOHR, GEORGE J., AND GUNDLACH, R. H. 1927. *The relation between physique and performance*. J. EXPER. PSYCHOL., 10(2): 117-157;
1929. *A further study of the relation between physique and performance in criminals*. J. ABNORM. PSYCHOL., 24: 91-103.
- RACHER, ALICE BRO. 1948. *Analysis of body build in 159 college women*. Unpublished Master's thesis, Dept. of Anthrop., U. of Chicago.
- RECKLESS, WALTER C. 1943. *The Etiology of Delinquent and Criminal Behavior*. Soc. Sci. Res. Council, Bull. 50: 1-167.
- ROSENBAUM, S. G. 1941. *Relation between constitutional characters and delinquent behavior*. Presented at the 12th annual meeting, American Association of Physical Anthropologists, Chicago, Apr. 7-8, 1941.
- ROSS, F. A. 1939. *Review of "The American Criminal."* AM. J. SOC., 45:477-480.
- SELTZER, CARL C. 1946. *Anthropometric characteristics and physical fitness*. RESEARCH QUARTERLY, March. Q383;
1946. *Body disproportions and dominant personality traits*. PSYCHOSOMATIC MEDICINE, 8(2): 75-97.
- SELTZER, CARL C., AND BROUHA, LUCIEN. 1943. *The masculine component and physical fitness*. AM. J. PHYS. ANTHROP., n. s., 1(1):95-106.
- SELTZER, CARL C., AND GALLAGHER, J. R. 1946. *Somatotypes of an adolescent group*. AM.

- J. PHYS. ANTHROP., n. s., 4(2):153-168.
- SELTZER, CARL C., WELLS, F. L., AND McTERNAN, E. B. 1948. *A relationship between Sheldonian somatotype and psychotype*. J. PERSONALITY, 6(4): 431-436.
- SHAPIRO, H. L. 1939. *MIGRATION AND ENVIRONMENT*. N. Y.: Oxford U. Press.
- SHAPLIN, J. T. 1942. *Personal equation in somatotyping*. MS., Library, Peabody Mus., Harvard U. Cited by Bullen, Adelaide K., and Hardy, Harriet L. 1946. *Am. J. Phys. Anthropol.*, n. s., 4(1): 39.
- SHELDON, WM. H. 1940. *THE VARIETIES OF HUMAN PHYSIQUE*. With the collaboration of S. S. Stevens and W. B. Tucker. N. Y.: Harper and Bros.
- SHELDON, WM. H. 1942. *VARIETIES OF TEMPERAMENT*. With the collaboration of S. S. Stevens. N. Y.: Harper and Bros.
- SHELDON, WM. H. 1949. *VARIETIES OF DELINQUENT YOUTH*. An Introduction to Constitutional Psychiatry. With the collaboration of Emil M. Hartl and Eugene McDermott. N. Y.: Harper and Bros.
- STREETER, G. L., PARK, E. A., AND JACKSON, DEBORAH. 1937. *Hereditary vulnerability to dietary defects in the development of bone*. SCIENCE, 85: 437.
- STUART, HAROLD C. 1946. *Normal growth and development during adolescence*. NEW ENG. J. OF MED., 234: 666-672; 693-700; 730-738.
- SUTHERLAND, E. H. 1939. *PRINCIPLES OF CRIMINOLOGY*. 3rd ed., Phila.: J. B. Lippincott Co.
- TALBOT, NATHAN B., SOBEL, E. H., BURKE, B. S., LINDEMAN, ERICH, AND KAUFMAN, S. B. 1947. *Dwarfism in healthy children: its possible relation to emotional, nutritional, and endocrine disturbances*. *New Eng. J. Med.*, 236: 783-793.
- THURSTONE, L. L. 1946. *Factor analysis and body types*. PSYCHOMETRIKA, 11: 15-21.
1947. *Factorial analysis of body measurements*. AM. J. PHYS. ANTHROP., n. s., 5(1): 15-28.
- TUCKER, WM. B. 1940. *Is there evidence of a physical basis for criminal behavior?* J. CRIM. LAW AND CRIMINOL., 31(4): 427-437.
- TUCKER, WM. B., AND LESSA, WM. A. 1940. *Man: a constitutional investigation*. QUARTERLY REV. BIOL., 15(3-4): 265-289, 411-455.
- WALLERSTEIN, JAMES, AND WYLE, CLEMENT J. 1947. *"Biological inferiority" as a cause for delinquency*. E. A. Hooton's findings reviewed and analyzed. NERVOUS CHILD, 6: 467-472.
- WEIDENREICH, FRANZ. 1946. *APES, GIANTS, AND MEN*. Chicago: U. of Chicago Press.
- WETZEL, NORMAN C. 1948. *The Treatment of Growth Failure in Children: an Application of the Grid Technique*. Cleveland: NEA Service, Inc.