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## THE PHYSICAL CAPACITY OF THE YOUNG ADULT CRIMINAL

BENJAMIN FRANK<sup>1</sup> and PAUL S. CLELAND<sup>2</sup>

The relation of physical traits to criminal behavior has long been an important aspect of the general etiological problem of crime and delinquency. Of historical significance is the work of Lombroso who was among the first to approach the problem scientifically and who promulgated his biological and anthropological theory of crime on the basis of observed physical characteristics and anomalies. The criminal was thus considered a distinct type, constitutionally determined and recognized by certain stigmata indicative of atavism or delinquency. Some adherents of this theory maintained that there were also sub-types such as thieves, murderers, and sex offenders, which were also distinguishable by physical stigmata.

In an exceedingly elaborate study of about three thousand English convicts, Goring attempted to prove the general invalidity of this theory of the "born criminal." In addition to a statistical analysis of comparative anthropometric data, Goring included a study of the relation of the physique of criminals to criminal behavior.<sup>3</sup> As indices of physique, Goring chose height, weight, span of arms, general health and physical constitution. He found no relation between type of crime and height, or type of crime and weight. Criminals convicted of violence to person and sex offenders were superior in health and constitution to other criminals and to the general population. There was no relation between stature, weight, health or constitution and the frequency of convictions. Goring insisted that these results indicated the absence of a criminal type or of sub-types and that whatever differences that were found could be better ascribed to factors of social selection, and to social and economic status. Although, there is general agreement today with Goring's conclusions, he can be criticized chiefly on the ground that his detailed statistical analyses were based largely on estimates of health and physical constitution, the reliability of which was not tested. General health was

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<sup>3</sup>Goring, C., *The English Convict*, London, 1913, Part II, Ch. I. Pp. 174-200.

rated as robust, good or delicate and estimates of physical constitution were defined in terms of muscularity and obesity.

More recent studies have attempted to isolate one or more physical traits or capacities and to apply more precise measurements but with results that are either negative or inconclusive. Thus, Healy<sup>4</sup> found that poor physical condition was relatively infrequent either as a major or a minor factor in the causation of delinquency. Kelley<sup>5</sup> found delinquents inferior in strength of grip and in lung capacity as compared to children of the same age. The most reliable study, perhaps, is that by Slawson<sup>6</sup> who found delinquents to be slightly superior in weight to school children of the same ages and of comparable social status. In height the younger delinquents were superior to non-delinquent boys, but the older delinquents tended to be slightly inferior. Nationality however was a factor in height. In both strength of grip and lung capacity, the delinquents were inferior.

Modern practice in physical education stresses the importance of the use of a series of more dynamic tests of physical capacity for purposes of measurement and classification. Static indices such as height and weight or the use of one or more isolated tests of capacity such as strength of grip or lung capacity are inadequate measures of total physical capacity. This paper reports an attempt to apply current practice in measuring physical capacity to the problem of the relation of physical traits to criminal behavior.

The battery of tests devised by Mac Curdy was selected because of the high degree of reliability and validity which has been reported for it and because of ease of administration and of scoring. The Mac Curdy test seeks to obtain a valid and reliable measure of the physical capacity of large muscle groups which may be used to classify pupils into homogeneous groups for physical education activities. Physical capacity is defined as the capacity of the large muscle groups to translate power and is "conditioned by two factors, that of muscular force inherent in the muscle fiber and that of muscular velocity inherent in the innervation of the muscle cells. Ideally these two factors should so combine in the expression of physical power that the result is efficient movement with the least expenditure of energy."<sup>7</sup>

The physical capacity index, as measured by Mac Curdy, combines two fundamental factors of power; *i. e.*, an index of muscular

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<sup>4</sup>Healy, Wm., *The Individual Delinquent*, Boston, 1915, p. 135.

<sup>5</sup>Kelley, T. L., *Mental Aspects of Delinquency*, U. of Tex. Bul., March, 1917.

<sup>6</sup>Slawson, John, *The Delinquent Boy*, Boston, 1926.

<sup>7</sup>Mac Curdy, H. L., *A Test for Measuring the Capacity of Secondary School Boys*, N. Y. U. Ph.D. Thesis. 1933, Ch. I.

force and an index of velocity. The Force index is the sum of the forces achieved on six tests of function, weighted equally in scoring. In each of the measures of force, two readings were taken and the higher one was used as the score.

1. Right Grip force, recorded in pounds of force achieved with the right hand on the hand dynamometer.
2. Left Grip force, recorded in pounds of force achieved with the left hand on the hand dynamometer.
3. Leg force, recorded in pounds of force as measured by the leg and back dynamometer.
4. Back force, recorded in pounds of force as measured by the leg and back dynamometer.
5. Arm pull, recorded as pounds of force achieved by the pull of the arms on the dynamometer.
6. Arm push, recorded as pounds of force achieved by the push of the arms on the dynamometer.

The velocity index is defined as "a measure of the accelerating potentiality of the large muscle groups during a unified action of the body as a whole."<sup>8</sup> In practice the velocity index is the maximum vertical distance, a subject can project his own weight up in the air. This was measured by the Leapmeter.<sup>9</sup> Each subject made five jumps and the best jump was used as the measure of velocity.

The physical capacity index was computed by multiplying the force index by the velocity index and dividing by one hundred. In other words physical capacity was being measured by the application of the mechanical principle that power is equal to force times velocity. The method of administering the tests followed as closely as possible the procedure outlined by Mac Curdy.

### *Results*

The group studied consisted of 504 inmates of the New Jersey State Reformatory at Rahway. The results of individual tests, and the combined physical capacity scores, together with the age, weight and height of the group is given in Table I.

The coefficients of correlation were computed by the Pearson product-moment technique. All the coefficients are very small and in relation to their probable errors, of very little significance.

<sup>8</sup>Mac Curdy, H. L., *op. cit.*, p. 8.

<sup>9</sup>The leapmeter used in this study was loaned by Dr. F. S. Lloyd, Prof. of Phys. Ed. of New York University.

TABLE I.  
PHYSICAL CAPACITY SCORES AND INDIVIDUAL TESTS.

<i>Tests</i>	<i>Mean</i>	<i>PEM</i>	<i>S.D.</i>	<i>r P.C.</i>	<i>with</i>
P. C. Score.....	515.18	4.29	143.00		
Height .....	69.95	.13	4.31	.04 ±	.03
Weight .....	152.00	.47	15.75	.04 ±	.03
Age .....	23.30	.10	3.39	.02 ±	.03
Right Grip .....	126.37	.55	18.40		
Left Grip .....	115.75	.55	18.40		
Arm Pull .....	361.02	1.72	57.35		
Arm Push .....	307.89	1.81	60.60		
Leg Force .....	704.40	7.26	242.00		
Back Force .....	330.00	1.50	50.25		
Best Jump .....	23.65	.08	2.73		

*Physical Capacity and Mental Level*

Earlier work on the physical basis of mental development has been well summarized by both Doll<sup>10</sup> and Whipple<sup>11</sup> and considerable evidence is produced supporting a positive relationship of physical superiority to mental superiority. Most of the measurements, however, dealt with height and weight and the more dynamic indices of physical capacity were limited to strength of grip and lung capacity. Doll seems to have been the only one to attempt seriously the use of a ratio of physical and psycho-physical measurements in its relationship to mental development.

Anderson<sup>12</sup> in a study of Yale and University of Minnesota students reported that height and weight as an index of physical development bore no relationship to intelligence. Gates<sup>13</sup> found no relationship between Binet mental age and each of six physical traits; *i. e.*, degree of ossification of wrist bones, height, weight, chest girth, lung capacity and strength of grip. But neither was there any significant relationship between anyone of the six measures and estimates of physical vigor. When all the physical tests were weighted, however, and a single index computed, the correlation between this index and estimates of physical vigor was  $+.61$  and with Binet Mental age the coefficient was  $+.21$ . Gates concluded that physical growth is specialized and has many phases and that physical development and

<sup>10</sup>Doll, E. A., *Anthropometry as an Aid to Mental Diagnosis*, Vineland Training School, Feb., 1916.

<sup>11</sup>Whipple, G. M., *Manual of Mental and Physical Tests*, Balto, 1914, Part I.

<sup>12</sup>Anderson, J. E., *Intelligence Tests of Yale Freshmen*, School and Society, 11:417-420, 1920.

<sup>13</sup>Gates, A. I., *Nature and Educational Significance of Physical Status and of Mental, Physiological, Social and Emotional Maturity*, J. of Educ. Psychol., 15:329-358, 1924.

mental development are largely independent variables. Baldwin<sup>14</sup> in a study of anthropometric measurements of gifted children reports a small but probably significant relation between Mental Age and height but no relation between Mental Age and other physical measurements such as breathing capacity, strength of grip, circumference of chest, and depth and width of chest.

Reports of psychological examinations were available on all cases in this study and findings were expressed both in terms of mental ages based on a variety of individual tests and in terms of mental levels as diagnostic categories. But since the use of mental levels as diagnostic categories is considered more valid in psychological practice than mental ages, particularly with adults, the coefficient of correlation between physical capacity and mental levels was computed by transmuting the distribution of scores in each mental level category to ordinates of a normal curve.<sup>15</sup> The distribution of physical capacity-scores with respect to mental level is in Table II. The coefficient, thus computed, is small, negative and probably insignificant.

TABLE II.  
PHYSICAL CAPACITY AND MENTAL LEVEL.

<i>P. C. Score</i>	<i>Superior</i>	<i>Average</i>	<i>Inferior</i>	<i>Borderline</i>	<i>Feeble-minded</i>	<i>Totals</i>
950.....	.	.	1	.	.	1
900.....	.	.	.	.	.	0
850.....	.	.	.	.	.	0
800.....	1	1	2	.	.	4
750.....	3	2	3	1	1	10
700.....	3	1	4	4	1	13
650.....	4	8	7	4	2	25
600.....	4	19	20	3	4	50
550.....	9	36	21	7	8	81
500.....	8	37	30	11	6	92
450.....	5	38	22	14	7	86
400.....	4	35	14	10	11	74
350.....	5	10	8	4	4	31
300.....	3	5	10	1	0	19
250.....	.	2	2	2	0	6
200.....	.	1	3	1	1	6
150.....	.	1	0	1	1	3
TOTAL ....	49	196	147	63	46	501*
Percent. ....	9.8	39.1	29.3	12.6	9.2	100.0

\*Three cases, in which diagnosis of mental level had been deferred by the psychologist, were omitted from this table.

<sup>14</sup>Baldwin, B. T., *Anthropometric Measurements, Traits of Gifted Children*, Vol. I., pp. 135-171, Stanford Univ., 1925.

<sup>15</sup>Holzinger, K. J., *Statistical Methods*, N. Y., 1928, Chapt. XIV, 256-262.

When the two extreme groups of the distribution, the superior and the feeble-minded, are compared, the superior group attains a mean physical capacity score of  $547.45 \pm 12.38$  and the feeble-minded group a mean score of  $500.00 \pm 14.08$ . Although the superior group is superior in mean physical capacity score, the probable error of the difference is 18.74. The difference therefore is 2.5 times the probable error of the difference, which is not large enough to make the difference between these two groups statistically reliable.<sup>16</sup>

*Physical Capacity and Type of Crime*

Goring found that prisoners convicted of crimes of violence to person and sex offenders were superior in general health and constitution to persons convicted of crimes against property, stealing and burglary. In Table III all the cases have been divided into three groups on the basis of the type of crime. Crimes against person include: highway robbery, assault, rape, manslaughter and murder; crimes against property: breaking, entering, larceny and arson. The third group includes those convicted of conspiracy, fraud, carrying weapons and sex offenses other than rape or assault.

TABLE III.  
PHYSICAL CAPACITY AND TYPE OF CRIME.

	<i>Against Person</i>	<i>Against Property</i>	<i>Other Crimes</i>
N .....	207	233	64
Mean .....	517.75	515.56	505.47
PEM .....	5.33	5.04	10.74
SD .....	113.50	114.00	127.50

SIGNIFICANCE OF THE DIFFERENCE.

	D	PE <sub>D</sub>	CR
Person—Property .....	2.19	7.33	.30
Person—Others .....	12.28	11.99	1.02
Property—Others .....	10.09	11.86	.85

The differences between these groups are small and when considered in relation to the probable error of the difference, the groups show no statistically reliable differentiation.

<sup>16</sup>The coefficient of correlation and the formula used for deriving the coefficient from Table II is:

$$r = \frac{\sum f y d y \left[ \frac{\bar{X} y}{\sigma x} \right] k}{N \sigma y} = -.049 \pm .030$$

### *Physical Capacity and Number of Commitments*

On the assumption that the "constitutional" criminal should show a significant relationship between the degree of physical defect and the number of convictions, Goring studied the relationship between height, weight, general health and constitution and the number of convictions but reports no such relationship.

The relationship between physical capacity and the number of commitments to penal or correctional institutions was studied by dividing the data into four groups, those cases having no previous commitments, those having one previous commitment, those having two previous commitments and a fourth group consisting of all cases who have had three or more institutional commitments. Table IV shows the comparative results for the four groupings.

TABLE IV.  
PHYSICAL CAPACITY AND NUMBER OF COMMITMENTS.

	<i>No Prev. Commit.</i>	<i>One Pre. Com.</i>	<i>Two Pre. Com.</i>	<i>Three or More</i>
N .....	185.	139.	100.	80.
Mean .....	497.97	527.00	523.50	522.50
PE <sub>M</sub> .....	5.90	7.21	8.13	9.23
SD .....	119.00	126.00	120.50	122.50
DM .....	.....	29.03	25.53	24.53
CR .....	.....	3.12	2.54	2.33

Although in this particular group those having no previous commitments are inferior in physical capacity to inmates having one or more previous commitments, the evidence with respect to the significance of the difference is inconclusive. But the results obtained do raise the question of the effect of institutionalization upon psychophysiological adjustment. Those inmates with institutional experience undoubtedly adjust more readily to later commitments and this adjustment may be reflected in physical or mental performance.

### *Physical Capacity and Nationality Groups*

In studying the relationship between nationality and physical capacity, the groups considered were the native born of native parents, the native born of Italian parents, the native born of a miscellaneous foreign parentage and the Negroes. These four groups probably make up the bulk of a prison population. The foreign born were excluded because of their comparatively small number. Table V shows the comparative results of these nationality groupings.

TABLE V.  
PHYSICAL CAPACITY AND NATIONALITY.

	<i>Negroes</i>	<i>Misc. Foreign Parents</i>	<i>Italian Parents</i>	<i>Native Parents</i>
N .....	111	153	117	105
Mean .....	544.82	517.48	500.64	498.50
PE <sub>M</sub> .....	8.36	5.67	6.91	7.17
SD .....	131.00	104.00	111.0	109.0

## SIGNIFICANCE OF DIFFERENCE.

	D	PE <sub>D</sub>	CR
Native—Negroes .....	46.32	11.01	4.21
Natives—Italians .....	2.14	9.95	.21
Natives—Misc. Group .....	18.98	9.14	2.07
Negroes—Italians .....	44.18	10.84	4.08
Negroes—Misc. Group .....	27.34	10.10	2.70
Italians—Misc. Group .....	16.84	8.93	1.88

The largest and most reliable differences are between the Negroes and the native group and between the Negroes and the Italian group, in each case the Negroes being superior. The difference between the Negroes and miscellaneous group, although in favor of the Negroes, is not large enough to be statistically reliable. There are no significant differences, between any of the white groups.

*Comparison With Non-Criminal Groups*

There were available test data on 50 Reformatory guards. The mean age for this group was 38.2. The mean physical capacity score was  $451.00 \pm 11.34$  and a SD of 118.85. The probable error of the difference between the guards and inmates was 12.12 which gave a critical ratio of about 5.3, more than large enough to assure complete reliability. Since these two groups were so widely disparate in age range, a comparison of the individual tests of the battery was made. On all tests of force the guards were reliably superior to the inmates. Only in the measure of velocity was the inmate group superior. Wide differences in age and weight were undoubtedly important factors in determining these results.

When, however, the inmate group is compared on the Leapmeter with a college group, both presumably in about the same age range, the differences are insignificant. The mean velocity score for a group of New York University students was  $23.36 \pm .18^{17}$  as compared to

<sup>17</sup>Data for college students were supplied by Dr. F. S. Lloyd, of N. Y. Univ.

a mean velocity score of  $23.65 \pm .08$  for the inmates (Table I). The difference of the means is very small and the ratio of the probable error of the difference is 1.5, which is too low to be reliable.

The practice of comparing groups of delinquents with non-delinquents is at best a dubious procedure. Rarely are such groups comparable either with respect to all constant factors or with respect to the variable factor being studied. Particularly is this true when institutionalized delinquents are being compared with non-institutionalized non-delinquents. Even if these two groups are equated for all other factors, the factor of institutionalization with its highly routinized mode of living has been ignored.

### *Summary and Conclusions*

An attempt has been made in this study to apply a battery of physical capacity tests to a group of young adult criminals with the following results:

1. There is no significant relationship between physical capacity and mental level.
2. There is no significant relationship between physical capacity and the type of crime committed.
3. The evidence for a relationship between physical capacity and the number of institutional commitments is inconclusive. The results obtained, however, do raise the question of the effect of institutionalization upon psychophysiological adjustment as reflected in the performance required by a battery of physical capacity tests.
4. The negroes are superior in physical capacity to all other native groups, either of native or foreign parentage.
5. The inmate group was superior to a group of guards in the same institution only with respect to velocity measures. On all tests of force the guards were superior. The wide differences in age and weight were probably significant factors as is indicated by the fact that a comparison of velocity measures between inmates and a group of college students showed no significant differences.

The chief purpose of studying the physical characteristics of whole groups of criminals or of delinquents should be to determine at least one of the bases of treatment both of person and of living conditions during the period of institutionalization and after. Only by such rational grouping and complete individual study can effective results in the treatment of criminals be expected.