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The Influence of Defective Physique and Unfavourable Home Environment on the Intelligence of School Children by David Heron

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Journal of the Royal Statistical Society, Vol. 73, No. 5 (May, 1910), pp. 547-551

Published by: [Wiley](#) for the [Royal Statistical Society](#)

Stable URL: <http://www.jstor.org/stable/2340176>

Accessed: 25/06/2014 07:48

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in his valuable work on "The Diseases of Occupations," points out that "it is a most difficult problem to solve, especially in the case of an industrial town population, how far the diseases met with in it are town-made and how far trade-made; the former almost always predominate. Neglect in weighing these two factors vitiates most published statistics and statements."

It is impossible to doubt the value of the official statistics which have from time to time drawn attention to the excessive rates of mortality in many unhealthy and dusty occupations, more especially those of potters and earthenware manufacturers, cutlers and scissor makers, file makers, gunsmiths, furriers and skimmers, lead manufacturers, glass manufacturers, tin and copper miners, and chimney sweeps. Such statistics of mortality probably only err in understating the truly excessive death-rates in these unhealthy occupations. Their value has been fully recognised by Dr. Arlidge and Dr. Oliver in their works dealing with unhealthy trades, and by legislative action tending to reduce the risks incidental to such occupations.

Neither do the foregoing considerations detract from the value of occupational mortality statistics dealing with occupations in which those engaged are, generally speaking, not liable to changes of occupation (as in the case of the learned professions), and in which those engaged may be presumed to live under, at any rate, very similar social conditions. In the case of statistics of most industrial occupations, however, the frequent change of occupation from various causes, and the obvious influence of class and social condition, appear to suggest the desirability of supplementing detailed statistics of occupational mortality with some form of class mortality statistics, in order if possible to determine what proportion of the excess of mortality, among those engaged in many industrial occupations, is due to class and social condition, and how much to the true effect of the occupations themselves. N.A.H.

3.—*The influence of defective physique and unfavourable home environment on the intelligence of school children.* (Eugenics Laboratory Memoirs. VIII.) By David Heron, M.A., Galton Research Fellow in National Eugenics. 60 pp., 4to. London: Dulau and Co., 1910. Price 4s.

This memoir by Mr. Heron is based on data which have been collected during recent years under the general direction of the Medical Officer of the London County Council Education Committee. The data include, for every child, its age, "standard," height and weight, an estimate by the teacher of its mental capacity under five heads ranging from "very dull and backward" to "brilliant," and an estimate by the medical officers of the condition of the teeth; and, for children in certain schools, an estimate of the state of nutrition, of the condition of the clothing, of the degree of personal cleanliness, of the power of hearing, of the condition of the cervical glands and of the tonsils, and adenoids. In all 4,286 boys and 4,474 girls in 14 different schools are dealt with. The following mean correlations are found between intelligence and the several other characters mentioned:—

Character.	Correlation with mental capacity.		Character.	Correlation with mental capacity.	
	Boys.	Girls.		Boys.	Girls.
Height	+ '10	+ '07	Glands	+ '09	+ '08
Weight	+ '06	+ '03	Tonsils	- '01	+ '11
Clothing	+ '04	+ '24	Teeth	+ '08	+ '09
Cleanliness	+ '14	+ '07	Hearing	+ '03	+ '17
Nutrition	+ '01	+ '08			

It will be seen that all correlations are small, and Mr. Heron concludes that (p. 58) "it is quite impossible to assert that the conditions dealt with in this investigation are the sources of the differentiation as to intelligence which we find between one child and another," (pp. 58 and 59) "There is little sensible effect of nurture, environment and physique on intelligence. Some such effect probably does exist, but it is clearly so small that only very accurate and extremely numerous observations based on homogeneous material are likely to lead to results persistently sensible having regard to their probable errors," and again (p. 60) "Some contribution unfavourable home environment and defective physique may make to the degree of intelligence, but even if finally demonstrated, it will be found to be a "second order" contribution, possibly even an indirect effect of race and stock, the abler children being those of fitter parents who give them better homes and better physique. Other factors of environment have yet to be discussed, but so far . . . there is no sign of an environmental condition producing an effect on the mentality of the child at all comparable with the known influences of heredity." These conclusions are of great importance if correct. But are they correct?

More than twenty years ago Dr. Francis Warner commenced to carry out two series of investigations (1888-91 and 1892-94) on mental and physical defects in school-children. These investigations covered 100,000 children in all, or more than ten times as many as those covered by the investigation which forms the basis of Dr. Heron's work. Two of the characters noted by Dr. Warner were "dulness" and "low nutrition"—characters which appear to correspond pretty closely to the "intelligence" and "nutrition" of Mr. Heron's data. Dr. Warner's data and methods were discussed in two papers read before this Society (vol. 56, 1893, and vol. 59, 1896) and were given more fully in a separately published Report (Report on the scientific study of the mental and physical conditions of childhood, 1895): they were also discussed, as illustrations, by the present writer in a memoir on association (*Phil. Trans.*, A., vol. 194, 1900). No reference is made by Mr. Heron to the work of Dr. Warner, and I conclude that he must have been unaware of it, a fact which is to be regretted, for one would have liked to have seen in this memoir some statement of his views as to the divergence between the results of the truly pioneer investigation undertaken by Dr. Warner, and the more recent investigation with which he is

concerned. Dr. Warner's data show a high degree of association between *dulness* and *low nutrition*: they show it for both sexes in different classes of schools (certified industrial schools, poor-law schools &c.), for different races (English, Jews, Scotch, Irish), and for children in different groups of Standards (Infants, Standards I—III, and Standards IV—Ex. VII). The association-coefficients given in the memoir cited are not comparable with Mr. Heron's correlation-coefficients, however, as the association coefficient is a good deal higher than the correlation coefficient for the same data. I have therefore worked out the correlation by Professor Pearson's "four-fold table" method, for a few of Dr. Warner's groups of data, in order to obtain figures comparable with those of Mr. Heron's memoir, and find the following results:—

Correlation between "dulness" and "low nutrition" for—

26,857 boys, 1888-91 investigation	0.53
26,287 boys, 1892-94 ,, 	0.56
23,143 girls, 1888-91 ,, 	0.64
23,713 girls, 1892-94 ,, 	0.58
2,631 boys, Jews, 1892-94	0.43
2,668 girls, Jews, 1892-94	0.47
803 boys, Scotch, 1 Edinburgh school, 1892-94	0.38
807 girls, ,, ,, ,, 	0.61

Mr. Heron admits that in starting his investigation he expected to find large correlations "possibly exceeding 0.5": certainly, the coefficients based on the totality of Dr. Warner's data do exceed 0.5, while those for the two distinct races are only slightly under 0.5. I agree with Mr. Heron that these are the sort of results that might have been expected: why then has he failed to find anything but a very low correlation? The answer, it seems to me, lies in the fact that his data, as to intelligence especially, are almost worthless and can prove nothing. Dr. Warner's was practically a "one-man" investigation: all the physical symptoms—development defects, nerve-signs, and low nutrition—were noted by himself without exception in the first investigation, and with few exceptions in the second; continuity of standard was thus ensured. The return as to "dulness" is stated to have been based on the teacher's report, but this does not quite convey the actual procedure. Dr. Warner himself, I understand, picked out certain children to begin with, and these, subject to the teacher's confirmation, were entered as "dull," together with such other children as were then reported as dull by the teacher (*cf.* Report, &c., p. 11). Dr. Warner's selections, his personal presence, and his explanations, would thus tend to secure a moderate degree, at least, of uniformity. Further, the investigation was voluntary and unofficial, and there would therefore be little probability that any teacher would consider that it might be to his or her disadvantage to enter children as "dull"—a possible source of error, as Mr. Heron suggests (p. 13) in the L.C.C. investigation. The L.C.C. data as to intelligence, Mr. Heron fully and freely admits, are exceedingly bad and enormously affected by the personal equation of the teacher in his use of the terms "very dull

and backward," "under the average," "average," "above the average," "brilliant." The percentage of children who are classed as brilliant ranges from 3 to 33 per cent. (in different schools) among the boys, and from 1 to 33 per cent. among the girls, while in one boys' school which was not used exactly 50 per cent. of the children were classed as brilliant, and in Standard III of that school, out of a class of 95, no fewer than 83 were marked "brilliant" (p. 11). I agree with Mr. Heron that "personal equation and not local differentiation contribute the bulk of the heterogeneity" (p. 12), but he seems to consider that he has eliminated the factors of personal equation and errors of judgment by dealing with each school by itself, and averaging the separate school coefficients so obtained. It is on this point that we differ. I cannot find, in the first place, that all the children of one sex in one school were classified by one and the same teacher: presumably they were classified in each class, mainly at least, by the teacher of that class, so that we would have varying personal equations to consider even within the individual school. Further, it does seem to me that, to a great extent, and unless they are very carefully controlled, the teacher's judgments are *relatively* as well as absolutely valueless—*i.e.*, that we cannot attach any great confidence even to the classifications of one teacher of a single class. His judgment is probably affected to some extent by the age of the pupils: "you find a child age 10 in Standard VI put as *moderate*," writes a correspondent to me, "and one of the same age in Standard II called *brilliant* because his extra experience of the world makes him shine among his younger fellows." Moreover, the quality "intelligence" or "general intelligence" is itself not defined, and it is exceedingly complex; the teacher may tend to lay a very undue stress on one or another aspect of intelligence, to the exclusion of others; it is even possible that his particular mode of teaching, or that of the school, may not tend to bring out at all some capacities that the child possesses. "It is idle to assert," writes Mr. Heron (p. 13), "that there is no such thing as 'general intelligence.'" He has missed the point of the criticisms that have been made against the use of such a term. The objection is clearly stated in the report of the Anthropometric Committee of the British Association—a Committee which has done the most invaluable work for standardising and improving the methods of anthropometry:—"Many of the words in popular usage express characters which are extremely complex resultants of a number of more elementary characters (*e.g.*, intelligence)." It is this complexity of the character, and the consequent scope that is given to genuine differences of judgment, and to absolute errors of judgment, that render it desirable to substitute more simple terms. Mr. Heron himself even goes so far as to think that "it is quite probable that some teachers have confused 'intelligence' with orderly behaviour and quietness, and so have classed some of the weaklings as 'intelligent,' while the physically active and noisy children were regarded less favourably" (p. 22). What weight, either relative or absolute, can be attached to such returns? And if the results can clearly not be accepted in

the case of "intelligence" and "nutrition," what reasons have we for supposing that any greater weight will attach to the other figures given? It is deeply to be regretted that Mr. Heron should have put forward such definite conclusions, of so far-reaching importance, upon so doubtful a foundation.

Amongst the correlation coefficients based on Dr. Warner's data, given above, are included coefficients for Scotch and for Jewish children, as Mr. Heron lays some stress on the fact that the admixture of races in many populations may give rise to fallacious conclusions: the Scotch, rather than the Irish, children were chosen for this purpose, in spite of their smaller numbers, because they were all drawn from one school and thus give correlations directly comparable with the coefficients for single schools given in the body of Mr. Heron's paper. While he is perfectly right in directing attention to the possible fallacy, it is evident that Dr. Warner's relatively large correlations are but very slightly affected by the mixture of races. Indeed, the figures in Dr. Warner's reports show that the divergence in respect of dulness between children suffering from low nutrition and normal children is far too great to be appreciably due to such a heterogeneity: some 30 to 40 per cent. of the low-nourished children are dull, against some 6 to 8 per cent. of the well-nourished. The divergences between the different races as regards both dulness and low nutrition are quite small.

In dissenting from Mr. Heron's estimate of the value of his data, and consequently from his conclusions, we do not desire to imply that the memoir itself is without value: on the contrary, a number of points raised are of importance, and several of the statistical methods that he has used are worthy of notice; for example, the calculation of "corrected school averages" for heights, weights, &c., based on the age-distribution of the total population of school children observed, instead of on the actual age-distribution of the children in each school, so that the corrected averages are comparable *inter se*. The use of similar methods is suggested in other cases also. The standard, or position in standard, of the child, corrected for age, it is pointed out, might be used as a measure of intelligence: such a measure would seem reasonable, and it is not clear why it was not adopted in the present memoir. To his paragraph on p. 4 of the memoir, suggesting the correction of the correlation between *character of child* and *environment*, for *character of parent*, we should like to devote some space, but this notice is already unduly long: it is perhaps sufficient to point out that a correlation between parent and child does not necessarily imply heredity. As a warning of the difficulties inherent in any such investigation as that with which he deals, and as indicating possible means of circumventing some of them, Mr. Heron's memoir may, in fact, be commended. I do not think, however, that the material is strong enough—or anything like strong enough—to bear the conclusions given at the end as regards the influence on intelligence of physique and of environment.

G.U.Y.