

THE REES-EYSENCK BODY INDEX AND SHELDON'S SOMATOTYPE SYSTEM

By

H. J. EYSENCK, Ph.D.

Professor of Psychology, Institute of Psychiatry, University of London

IN a recent paper, Parnell (1957) has criticized the Rees-Eysenck Body Index (Rees and Eysenck, 1945) on a number of grounds. He also showed that high values on the index corresponded to high values of Sheldon's ectomorphy component, while low values on the index corresponded to low values of the ectomorphy component, and high values of the endomorphy and more particularly the mesomorphy components. In this paper a brief attempt will be made to answer Parnell's criticisms and indicate why the Rees-Eysenck Body Index appears to be preferable to the Sheldon system.

Parnell starts off by stating that "statistical treatment by itself, however sophisticated, is no substitute for the best or right choice of measurements". He goes on to say that "in any morphological classification aimed at achieving high correlation with behaviour, it would seem reasonable at least to separate fat and its function from muscle and motive power". He illustrates his point by presenting photographs of two men of equal score in the B.I., who differ profoundly in the sense that one is fat and the other one muscular. He concludes "that measurements of fat and muscle should be added to the correlation matrices from which factors are derived in future analyses".

Parnell by implication assumes that the variables included in Sheldon's system constitute "the best or right choice of measurements". This view is not shared by competent and sophisticated reviewers of the field. Thus, in a recent paper, Humphreys (1957) discussed Sheldon's typology and introduced his paper with the following words: "The writer became interested in Sheldon's physical and temperamental types because they have been so widely, and frequently so favourably, discussed in recent years. Relatively little investigation was needed in order to discover that the favourable discussions had little foundation in fact for the attitude expressed and that the use of Sheldon's types in further research should be discouraged". Most of the criticisms made by Humphreys, as well as those by Ekman (1951) and Eysenck (1953), are statistical in nature. Sheldon requires three variables for his description of body build, as well as for his description of temperamental types. In both spheres these components show quite high negative correlations with each other, and both Humphreys and Ekman, using different methods, have shown conclusively that the data can be described just as efficiently with two uncorrelated variables as with three correlated ones. The obvious statistical difficulties of working with three negatively correlated variables when two orthogonal ones would do equally well, would seem to suffice in ruling Sheldon's system out of court. As Humphreys says, "Research workers, if they want to make use of Sheldon's types, are advised to discard one physical type and the corresponding temperament type. This would result in a saving of measurement time and statistical analysis of data. If multiple regression analysis is planned, however, the recommended procedure becomes compulsory. Beta-weights can be reliably

determined on only two of three mutually dependent variables. Even if the research worker in this field discards one of the three types, he can still have no confidence in the meaningfulness of the two retained."

It is not only the choice of measurements which is impugned by recent criticism. Sheldon claims to have established correlations of the order of .8 between body build and temperament. However, as has often been pointed out, the data on which these correlations were based were contaminated by the fact that both sets of ratings were made by the same judge. Later work, not involving such contamination, has usually resulted in correlations in the neighbourhood of .3 at best (Eysenck, 1953). As Humphreys says, "Sheldon's claims for having established relationships between physique and temperament, are thus 'thrown out of court' for lack of evidence". Parnell thus seems to be on dangerous ground in assuming the adequacy of Sheldon's typology, and in view of the fact that all these criticisms had already appeared in print when he wrote his paper, one might have expected him to back his choice of Sheldon's system in some way by a rebuttal of the criticisms made of it. (Humphrey's paper appeared only in 1957, but the arguments quoted from it had been made earlier by Ekman (1951) and Eysenck (1953).)

We must now return to the Rees-Eysenck Body Index and consider Parnell's criticisms of it. In their work Rees and Eysenck were particularly concerned with the more permanent variables defining physical habitus, i.e. with skeletal measurements. Taking a wide variety of measures of a standard anthropometric kind on several populations, and intercorrelating and factor analysing these measures, they discovered, as had several other authors previously, that two factors were adequate within relatively narrow limits to account for all the communal variance. (A review of the earlier work has been given by Eysenck (1953). It should be noted that the application of factor analysis to physical measurements was not initiated by Burt, as Parnell claims, but by Spearman (1927), some fifteen years earlier.)

The two factors which appear to describe physical habitus with such remarkable accuracy, can be manipulated statistically in various ways. We might think of the body as a rectangle, having a given height or length (L) and a given width or breadth (B). Total height appears to be a good measure of L, and transverse chest diameter appears to be a good measure of B. If we multiply $B \times L$ we have a measure of the total area of the rectangle, or, in the case of the body, total body size. If we divide $\frac{L}{B}$ we have a good measure of the

proportions of the rectangle, i.e., whether it, or the body which it represents, is lean and narrow, or broad and squat. With some suitable statistical refinements, the Rees-Eysenck Index attempts to fulfil the latter of these requirements and gives what we consider to be a reasonable and adequate description of the relative linearity of the person's skeletal development. We have also dealt with total body size (Rees and Eysenck, 1945) and have found quite sizeable relationships between body size and temperament; for the purpose of this paper, however, these developments would appear to be irrelevant.

Parnell criticizes our index for not incorporating measures of the relative preponderance of fat and muscle. This does not appear to be a reasonable criticism. Any measure in science is useful to the extent that it isolates one important variable. Any attempt to complicate it by adding other variables makes the measure useless. Parnell's Figure 1 (p. 211) suggests that the mesomorph/endomorph (muscle/fat) dimension is orthogonal to the Rees-

Eysenck Index. It is difficult to see how the two can be combined, or what possible meaning such a combined index could have. Our index sets out in the most economical and reliable manner possible, to give a numerical description of a relatively permanent body type defined by the skeleton; it does not claim to measure the fat/muscle ratio, just as little as it attempts to measure the subject's intelligence. It is difficult to see, therefore, the relevance of Parnell's illustrative example showing that people having the same body index may differ in respect to their fat/muscle component. This hardly requires demonstration as it follows from the method of derivation of the index, just as it follows that of people having the same body index, some may be bright and some may be dull.

Parnell might revise his criticism to read something like this: The Rees-Eysenck Body Index leaves out of account an important variable in body build, which has significant correlations with temperament. Accordingly the muscle/fat ratio is suggested as an *additional index* which may be of greater interest and importance from the point of view of its psychological correlates than is the Rees-Eysenck Index. An adequate description of a person's physical habitus at any given time should include both these indices as well as, perhaps, an index of general body size such as that advocated by Rees and Eysenck. Such a reformulation lends itself to both a theoretical and an empirical examination and we will accordingly turn next to a brief discussion of these points.

There can, of course, be no objection to the proposal that a special index should be established dealing with the respective predominance in the body of fat and muscle; Lindegard (1953, 1956) has brought forward many considerations in favour of such a proposal. An index of this kind, however, would most certainly be much more changeable than an index of skeletal body build such as the Rees-Eysenck Index. Most psychiatrists will be familiar with the young athletic type who puts on fat in middle age; there seems to be little doubt that such a person would change his position on the continuum defined by any such new index proposed to a considerable extent. Equally, we have the findings of the Minnesota Starvation Study which showed beyond doubt that gross changes in respect of the non-skeletal components of body build can be produced by environmental influences.

Granted this weakness, the question of the usefulness of the fat/muscle index in predicting personality variables becomes a purely empirical one. Does such a new index give us correlations with temperamental variables which are different from, or higher than, those obtained by means of the Rees-Eysenck Index? In answering this question tentatively at least we shall make use of a recent paper by Davidson, McInnes and Parnell (1957) dealing with personality traits of 50 boys and 50 girls, all aged seven. Before looking at the results of this study, it may be useful to recapitulate the relationships between personality and the Rees-Eysenck Index as demonstrated and postulated in a series of studies (for a brief review of some of this work, see Eysenck, 1953). Put very briefly, we have found that there is a correlation of about $\cdot 3$ between leptomorphic body build and introverted personality traits. Similarly, we have found that there is a correlation of the same order between leptomorphic body build and neurotic personality traits. These relationships have been observed by others also, and may be regarded as relatively well established. It should be noted, of course, that the terms "introversion" and "neuroticism" are not necessarily used in the psychiatric sense but have the operational meaning given to them by a series of experimental studies originating with *Dimensions of Personality* (Eysenck, 1947) and culminating recently in the theory developed in *The*

Dynamics of Anxiety and Hysteria (Eysenck, 1957). According to the data there presented, hysterics and psychopaths are people who score high on neuroticism and extraversion, while dysthymics (anxiety states, reactive depressions, obsessionals) are people who score high on neuroticism and introversion.

We have already indicated that Parnell's data suggest that the ectomorphic component of Sheldon corresponds rather closely to our concept of leptomorph body build. Accordingly, we would expect ectomorphs to show introverted and neurotic personality traits as compared with mesomorphs and endomorphs. That this is so is strongly suggested by the characterization Sheldon gives of cerebrotonics. The following traits he mentions are typically introverted: "love of privacy, socio-phobia, inhibited social address, need of solitude when troubled, introversion". To this list might be added the item "resistance to alcohol, and to other depressant drugs"; evidence on this point is given in a series of papers recently published in this journal (summarized in Eysenck, 1957) and in the work of Shagass (1955, 1956) and his collaborators on the sedation threshold. Items characteristic of neuroticism are the following: "physiological over-response, mental over-intensity, apprehensiveness, hypersensitivity to pain, chronic fatigue". Conversely, items characteristic of extraversion and normality (as opposed to neuroticism) are apparent in Sheldon's description of the viscerotonic and somatotonic types.

When we now turn to the empirical study mentioned above, we find the following results. On scholastic attainment tests of reading ability, ectomorphs were distinctly superior to the other groups, correlations of $\cdot 3$ and $\cdot 4$ being observed. This result agrees well with the finding reported by Himmelweit (1945) who found extraverts (hysterics) to have a poor vocabulary relative to their intelligence, while introverts (dysthymics) were found to have a good vocabulary. Our prediction that ectomorphs would show introverted personality traits is thus supported on this point.

The next finding in this study relates to the Rorschach test. Here ectomorphs were found to have relatively high movement responses, while the endomorphs are relatively higher on form and colour. (The data are inadequately presented for the mesomorphs, so that little can be said about them. The authors find a significant correlation between mesomorphy and total number of responses given, but apparently did not partial out this factor from their correlations between body build and Rorschach scores.) As far as they go these results are in line with the finding by Eysenck (1956) that movement responses were correlated with introversion, while form and colour responses were correlated with extraversion. In view of the unsatisfactory statistical treatment given to their data by Davidson *et al.*, even this result however must be regarded as quite tentative.

When we turn to psychiatric assessments we find that "boys and girls with high standards tend to be more slender in build than average". This finding of a correlation between ectomorphy and high social standards is well in line with Eysenck's (1957) demonstration of a relationship between introversion and tender-mindedness on the one hand, and extraversion and criminal/psychopathic behaviour on the other. It is of interest in this connection that several recent studies have shown a distinct relationship between delinquent behaviour and mesomorphic body build.

The psychiatric assessments also demonstrated a relationship between ectomorph body build and anxiety and emotional unrest. This supports our finding of high neuroticism being associated with leptomorph body build. Nightmares and night terrors, too, were more frequent among ectomorphs.

There is another method of testing Parnell's hypothesis. We can derive ratio indices of physique by dividing the mesomorph component into the ectomorph component, the endomorph component into the ectomorph component, and the mesomorph component into the endomorph component. According to Parnell's hypothesis the last of these ratios should give particularly high correlations with external criteria of personality; according to our view it should be the former two ratios which would produce this result. Smith (1957) has reported such a study on 181 students tested on four of the MMPI scales. The mean correlation of the endomorph-mesomorph ratio with these four scales was .19; that of the other two ratios was .33 and .48. With one exception, *all* the correlations which had been expected to be significant on the basis of our hypothesis were significant at the 1 per cent. level; with one exception, *none* of the correlations predicted to be significant on Parnell's hypothesis were so, even at the 5 per cent. level. The actual correlations show a quite marked tendency for introverts to be leptomorph in body build. There was no neuroticism scale included, but the hypomania scale, which has often been found to correlate negatively with neuroticism, was found to correlate negatively with leptomorph body build also.

It will be clear that the findings of these studies are in good agreement with the hypothesis linking leptomorph body build with introversion and neuroticism. The writer has failed to find any evidence in these studies of a relationship between temperament and body build which required the postulation of an additional factor in the description of body build, and we may conclude that Parnell and his associates have failed to make out an empirical case for the usefulness of their suggested muscle/fat component. Until such evidence is forthcoming, we must remain sceptical of the value of this suggestion. From the available evidence it is difficult to come to any conclusion other than that the Rees-Eysenck Index, as compared with Sheldon's system, is not only superior, statistically and empirically, in the description of body build, but that it also fits into a much simpler description of temperament without any loss of empirical information.

One further argument is open to Parnell. He might argue that according to Sheldon the three components of body build are derived from the three embryological layers, and that accordingly any reduction to two components would do violence to the physiological facts. The answer to this point is relatively simple. The embryological hypothesis which was originally put forward in Italy, Austria and Germany around the turn of the century is superficially feasible but is supported by no empirical verification whatsoever. Until some attempt is made to provide such verification we can only regard it as an interesting speculation the value of which it is impossible to assess.

SUMMARY AND CONCLUSIONS

The objections of Parnell to the Rees-Eysenck Index of body build have been examined and found to be based on erroneous premises. A critique has been offered of Sheldon's system of somatotyping which was stated by Parnell to be superior to the Rees-Eysenck Index. Finally, a comparison was made between the two systems in terms of their ability to account for certain empirical findings reported by Parnell and his associates with respect to the relationship between body build and temperament. It was concluded that Sheldon's system was unnecessarily complicated, statistically inadequate, and theoretically not well founded. It was demonstrated that the Rees-Eysenck Index could embody the established empirical findings without apparent loss of information, despite its simplicity.

REFERENCES

- DAVIDSON, M. A., McINNES, R. G., and PARNELL, R. W., "The distribution of personality traits in seven-year old children", *Brit. J. educ. Psychol.*, 1957, 27, 48-61.

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- EKMAN, G., "On the number and definition of dimensions in Kretschmer's and Sheldon's constitutional systems", in *Essays in Psychology Dedicated to Dawid Katz*, 1951. Uppsala: Almqvist.
- Idem*, "On typological and dimensional systems of reference in describing personality", *Acta psychol.*, 1951, 8, 1-24.
- EYSENCK, H. J., *Dimensions of Personality*, 1947. London: Routledge & Kegan Paul.
- Idem*, *The Structure of Human Personality*, 1953. London: Methuen.
- Idem*, "The inheritance of extraversion-introversion", *Acta psychol.*, 1956, 12, 95-110.
- Idem*, *Dynamics of Anxiety and Hysteria*, 1957. London: Routledge & Kegan Paul.
- HIMMELWEIT, H., "The intelligence-vocabulary ratio as a measure of temperament", *J. Person.*, 1945, 14, 93-105.
- HUMPHREYS, L. G., "Characteristics of type concepts with special reference to Sheldon's typology", *Psychol. Bull.*, 1957, 54, 218-228.
- LINDEGARD, B., *Variations in Human Body Build*, 1953. Copenhagen: Munksgard.
- Idem* (ed.), *Body Build, Body Function and Personality*, 1956. Lund: Gleerup.
- PARNELL, R. W., "The Rees-Eysenck Body Index of individual somatotypes", *J. Ment. Sci.*, 1957, 103, 209-213.
- REES, W. L. L., and EYSENCK, H. J., "A factorial study of some morphological and psychological aspects of human constitution", *J. Ment. Sci.*, 1945, 91, 8-21.
- SHAGASS, C., and NAIMAN, J., "The sedation threshold, manifest anxiety, and some aspects of ego function", *A.M.A. Arch. of Neurol. and Psychol.*, 1955, 74, 397-406.
- Idem*, "The sedation threshold as an objective index of manifest anxiety in psychoneurosis", *J. psychosom. Res.*, 1956, 1, 49-57.
- SMITH, D. W., "The relation between ratio indices of physique and selected scales of the Minnesota Multiphasic Personality Inventory", *J. Psychol.*, 1957, 43, 325-351.
- SPEARMAN, C., *The Abilities of Man*, 1927. London: Macmillan.

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H. J. Eysenck

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References

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