A SIMPLISTIC APPROACH TO STRUCTURAL DYSPLASIA ASSESSMENT: DESCRIPTION AND VALIDATION

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ABSTRACT

The purpose of this study was to formulate a simplistic method of assessing human structural dysplasia and to validate a classification system that would objectively categorise the type and extent of such dysplasia through the use of indices. Anthropometric measurements were taken from a sample of 222 male college students, length/breadth ratios were formulated, and upper/lower body classifications were made in terms of type and subtype dysplasia. Correlation validation results were highly significant. Body composition data information was also provided for descriptive purposes.

INTRODUCTION

Measurement of human structural dysplasia is not new to the field of anthropometric morphology. Over the years, dysplasia typologies have been developed and have exemplified the growth of such systems. Earlier classification methodologies were centred around the measurement of the extremes of body types (Kretschmer, 1925), the structural disharmony of body parts (Viola, 1937), and the integration of unequal component (endomorphism, mesomorphism, and ectomorphism) mixtures in the different regions of the body (Sheldon et al, 1940). Subjective (anthroposcopic) and objective (anthropometric) methods of study were utilised in the makeup of these systems.

Recent typological systems of dysplasia, however, have demonstrated a more uniform approach to such assessment. Dysplasia can be described as the structural deviation from a given norm and the measurement methodology has been more index oriented. Unlike the earlier body type and somatotype oriented systems of classification, indices are generally computed from ratios of two or more measures that directly demonstrate the anthropometric differences of body parts to one another relative to representative average norms. The measures involved usually include those of height, weight, body lengths, breadths, and circumferences.

Hirata (1964, 1966) employing his Stout-Lean F-Index, studied the physiques of Japanese athletes at

the Tokyo Olympics. He described and classified the diversity of body builds among the athletes from a variety of sports activities. Behnke (1968) demonstrated structural bodily deviations through somatogram representations of body size and shape which noted disharmonies from designated norms relative to skeletal and girth measurements. Dupertuis (1974) developed a structural profile describing dysplasia through percentage breadth/height ratio deviations from average values. Battinelli (1974-1977) used the Dupertuis' formulas in his development of a positive/negative upper/lower body dysplasia classification system.

The purpose of this study is to formulate a simplistic method of assessing human structural dysplasia and to validate a classification system that will objectively categorise the type (direction) and subtype (extent) of such dysplasia through the use of indices.

Dysplasia Assessment and Classification

The anthropometric data used in this study was obtained from 222 male college students from Fitchburg State College in Fitchburg, Massachusetts. The structural measurements were taken according to the measurement descriptions and on the designated landmarks advanced by Behnke and Royce (1966). The anthropometric landmarks included those of the upper (biacromial, chest, elbow, and wrist breadths) and lower (biiliac bitrochanteric, knee, and ankle breadths), trunks and limbs. Height measurements

TABLE II

Dysplasia type mean.
Descriptive measurements.

Types	Number (n)	Height (cm)	Weight (kg)	L.B.W. (kg)	% Fat %
B/B	75	175.01	76.36	64.58	15.43
B/L	40	177.33	69.64	62.06	10.88
L/L	81	184.97	70.49	63.02	10.59
L/B	26	179.63	71.71	63.39	11.60

Statistical Treatment

The Pearson Product Moment Correlation Subprogram (Nie et al, 1975) was used as the statistical approach to validate the investigator's indices formulas. The author's height/breadth ratios were correlated with the breadth/height ratios developed by Dupertuis (Battinelli, 1976).

Results

The means and standard deviation scores are shown in Table III for both the Battinelli and Dupertuis methods of dysplasia assessment. Correlation results were shown to be significant beyond the .01 level of confidence for upper body ($r = .9672$) and lower body ($r = .9860$) dysplasia (Table IV).

TABLE III

Upper/Lower Body Dysplasia.
Mean and Standard Deviation Scores.

Variable	Cases	Mean	Standard Deviation
Upper body Dysplasia	222	1.884 48 (B) 100.587 (D)	.093269 (B) 4.68600 (D)
Lower Body Dysplasia	222	1.88767 (B) 099.851 (D)	.087395 (B) 4.69127 (D)

(B) — Battinelli Indices
(D) — Dupertuis Indices

TABLE IV

Upper/Lower Body Dysplasia.
Correlations.

	Upper Body Dysplasia (D)	Lower Body Dysplasia (D)
Upper Body Dysplasia (B)	-.9672	-.7082
Lower Body Dysplasia (B)	-.7169	-.9860

Discussion

Criticisms have been directed towards the use of body build indices in the study of human constitutional morphology. Sills (1974) in an overview of the field of anthropometry reported that the use of two or three measurements did not satisfactorily provide pertinent body build rating data. Dorney, Duckworth and Morandi (1964) in their analysis of physique rating systems stated that body build indices provided only basic data and insufficient information necessary for effective constitutional analysis.

In his approach, the author has tried to provide such basic representative data along with the more changeable body composition aspects necessary for constitutional assessment. All of the breadth measurement landmarks relative to height were used in the ratio formulations instead of the one or two factorial representatives common to indices utilisation. Descriptive data information such as height, weight, lean body weight, and percent of body fat were also provided.

In reference to the processes of assessment, calculative statistical utilisation of the mean and standard deviation units enabled the investigator to provide method objectivity and to express upper/lower body length/breadth ratio deviations from the norm.

The results of this study show that the investigator's simplistic method of dysplasia assessment and classification with additional reference information gained from body composition measurement can objectively identify and qualify disharmonic morphological types and subtypes.

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BOOK REVIEW

Title: MUSCLES, TESTING AND FUNCTION (Third Edition)
Author: Florence Paterson Kendall, PT and Elizabeth Kendall McCreary
Publisher: Williams & Wilkins, 1983
Price: £20.75

It is thirty years since the first edition of this book was published during the period when poliomyelitis epidemics were common. This, the third edition, has been expanded to include a section of muscle function in relation to posture and includes remedial exercise programmes.

The book starts with a chapter on Fundamental Principles in Manual Muscle Testing, and goes on to describe isolated and combined joint motion. This is followed by the technique, planning and use of spinal nerve and muscle charts. A page is then given over to each individual muscle, and includes an anatomical illustration of the muscle, photographs demonstrating the techniques of testing function and an explicit, clearly laid out text to support the illustrations and discuss the effects of weakness or contracture in the muscle. The quality and printing of illustration, photograph and text is excellent. The book ends with a short bibliography and an extensive list of further selected reading.

The book is a reference volume that any Physiotherapy Department would welcome in its library. I would like to see it expanded further to include basic muscle and joint mechanics and chapters on the modern techniques of gait analysis and kinesiology. Whilst accepting the limitations the authors set, it is a pity that occasionally they do not refer to possible underlying pathologies; for example, six pages are given over to testing for hamstring tightness without a reference that this may be due to mechanical instability in the lower lumbar spine.

The physiotherapy student may find that this book will relieve buying an anatomical tome, but for the medical clinician the small M.R.C. booklet on Muscle Testing, which fits easily into a pocket, is more functional.

J. A. Robertson