

ANTHROPOMETRIC AND PHYSICAL FITNESS CHARACTERISTICS OF FOUR ETHNIC GROUPS OF HIGH SCHOOL BOYS

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Since the inception of physical education in this country, anthropometric measurements have been routinely employed in appraisal programs as indices of classification to assess normal growth, nutrition, and body build (somatotype). The most commonly used indices are those of McCloy,¹⁰ and Neilson and Cozens.¹² The American Association for Health, Physical Education, and Recreation (AAHPER), Youth Fitness Manual presented norms based on the Neilson and Cozens classification index as well as norms based on age alone. Gross and Casciani¹⁶ have questioned the validity of age, height, and weight as criteria for classification for AAHPER Tests. Espenschade² recommended the use of age alone. Fleishman³ pointed out that within standard age groupings, height and weight may be correlated positively with performance on one test, negatively on another, and uncorrelated with most tests. Norms developed within different "size" classifications for a given age group frequently show no consistent differences between size categories.

Body size (height and weight) is positively correlated with age; i.e., body size is bound to be greater in older children. The indices of age, height, and weight do not account for wide variation in body size which can only be properly assessed by measurements of body build. One of the primary limiting factors to physical performance is excess body weight;¹ excess weight is negatively correlated with flexibility⁸ and highly correlated with the body weight for any given age and height group, particularly the fat over the tricep of the arm.¹³ An inverse relationship between excess body weight and endurance is observed in tests of pulse recovery or run time.⁵ The measurement of strength, although a complex factor, is positively correlated with mesomorphy (muscular development).³

A comparative study in physical fitness between

Hawaii's public school students and a national sample was published in 1968 by the Office of Instructional Services, Physical Education and Athletics Section, Hawaii State Department of Education (DOE).⁴ The report cited a downward trend in physical fitness between 1960 and 1966 among Hawaii's school youths.⁵ The DOE report prompted an interest among the authors of this report to explore the problem from a more intensive, anthropometric point of view with two purposes in mind: (1) to compare current fitness levels of high school boys in Honolulu with results of the 1968 DOE report, and (2) to measure the structural differences between four selected ethnic groups and to determine if these differences significantly affect the functional response/physical fitness levels of a standardized test.

An exploratory study was conducted with 180 high school boys participating in the required Physical Education program at Roosevelt High School in Honolulu. The selection of students for the survey was random to the degree that the scheduling of physical education at a particular day and hour can be considered random. Subject identification by ethnic group was limited to four of the major ethnic groups on the island of Oahu—Japanese, Chinese, Caucasian and Hawaiian. Ethnic identification was traced back through the subjects' grandparents by means of a standardized survey form.

The subjects were measured during their regularly scheduled physical education class. The class was subdivided into groups and proceeded through a series of designated testing stations. Measurements of body size, composition, respiratory-circulatory function, and physical fitness were performed on each individual over a period of two to three class sessions.

The anthropometric measures used included the McCloy method to predict normal weight; the



Michaels-Katch,¹¹ and Sloan¹⁵ methods of determining body density; and the Heath-Carter⁷ method of somatotyping. Functional measurements were made of the respiratory system by vital capacity and expiratory force tests, and of the circulatory system by the Gallagher-Brouha step-up test with pulse recovery. Physical fitness was determined by the Fleishman, Ten-Item, Physical Fitness Test Battery (PFI). This was found to be convenient to use and has been cross-validated with the AAHPER Test. Finally each subject was asked to complete a personal inventory of medical history, family background, physical activity and recreational interests. A separate four-day dietary survey completed this aspect of the project.

The results of this exploratory study yielded the following information:

- A. A comparison of the percentile scores of the test items and of the total scores between the 1968 Hawaii study and the current pilot study showed a mean difference of -18% (i.e., 18% lower in the present study) on four items: pull ups, softball throw, shuttle run, and 600-yard run. One score, leg lifts, ranked 5% higher in the current study. The mean difference for total scores was -17%.

Results of the current study were found to be comparable to the norms of the national sample (PFI of 55).

- B. Ethnic comparison on above test items within the current study indicated that:
1. The Japanese scored quite high in trunk strength, above average in power, and about average with the present sample in the other fitness measures.
 2. The Chinese were below the sample average on all test scores particularly in explosive power.
 3. The Caucasians were slightly below the

sample average in explosive power but above average in dynamic strength and endurance.

4. The Hawaiians were about average in endurance, slightly below average in dynamic strength, but well above average in explosive strength.

- C. Structural and functional measurements of ethnic groups within the current study indicated:

1. Stature and skeletal size were significantly different among the four ethnic groups.

2. Differences in skeletal size along with muscular development contribute to the significant differences observed in body builds—somatotype ratings.

3. Variance in skeletal and muscular size underlies the discrepancies between predicted, normal, and residual weights using the McCloy method.

4. The estimation of body density and the calculation of non-essential fat by all methods proved to be insignificant between ethnic groups in the current study.

5. Circulatory fitness (step-up test and 600-yard run) were not significantly different among the ethnic groups.

6. General motor fitness measured by the Ten-Item Fleishman test was not significantly different among the four ethnic groups; however, performances in the softball throw, hand grip, and leg raises were significantly different.

- D. Study of structural-functional relationships revealed that:

1. Stature which is significantly different among the ethnic groups is highly correlated to body weight, hip width, ectomorphy and vital capacity.

2. Chest size which is commonly accepted

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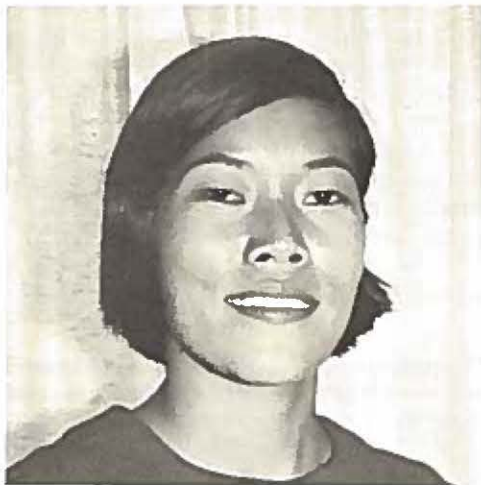
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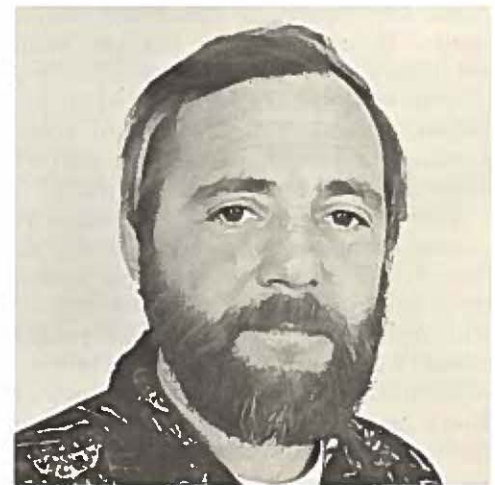
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