

## TESTS OF PHYSICAL FITNESS AND BODY PARAMETERS

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**Summary :** Fitness index and Valsalva ratio were determined in 57 healthy male students between the age group of 18-23 years. Correlation between these and body parameters was not statistically significant. However, as body parameters alone do not always give correct information about the physical fitness, finding out the fitness index and Valsalva ratio may provide a better assessment.

**Key Words :** fitness index      valsalva ratio      body parameters

## INTRODUCTION

Efficiency of circulation lies in giving a prompt response to any sudden stress and then returning to normal limits as soon as the stress is over. This has been the basis of various cardiac efficiency tests (1, 2, 3, 6, 10). It is in this respect that the Harvard step test and Valsalva maneuver are of interest to the circulatory physiologist. In this paper, the correlation of these tests with various body parameters is being reported.

## MATERIALS AND METHODS

The height, weight and surface area of 57 healthy male students (age 18—23 years) of Medical college, Aurangabad were determined.

**Harvard step test :** The pulse rate of each subject was recorded after allowing him a comfortable bed rest for  $\frac{1}{2}$  hr. He was then asked to step on and off a 20" high platform at the rate of 30/min for 5 minutes. The pulse was counted in the post-exercise period between 1 and  $1\frac{1}{2}$  min, 2 and  $2\frac{1}{2}$  min, and 3 and  $3\frac{1}{2}$  min. The fitness index was calculated in the following manner as done by earlier authors (5, 8, 10):—

$$\text{Fitness index} = \frac{\text{duration of exercise in seconds} \times 100}{2 \times \text{total of 3 half minute pulse counts}}$$

**Valsalva maneuver :** The subject was asked to maintain an expiratory pressure of 40 mm Hg for 10 seconds. The equipment consisted of a mouth piece attached to a mercury manometer by a rubber tube. A large bore hypodermic needle placed in the tube provided a small leak which prevented the subject from maintaining the intraoral pressure with cheek muscles while making the expiratory effort (9). Heart rate was recorded continuously by EKG throughout the strain period and for 15 sec following the release of strain. The Valsalva ratio was calculated as :

$$\frac{\text{maximal R-R interval during 15 sec of post-strain period}}{\text{minimal R-R interval during 10 sec of strain period}}$$

While selecting the R-R intervals, the ones associated with premature beats were excluded.

Both procedures were explained to each subject so that his co-operation was readily available. A rest period of 1 hr was always allowed between the two tests.

### RESULTS

The observations are summarized in Table I. The correlation coefficient of fitness index and Valsalva ratio with body parameters and resting pulse rate is shown in Table II.

TABLE I: Fitness index, Valsalva ratio, body parameters and resting pulse rate in 57 males.

| Readings                            | Mean  | S.D.  | Coefficient variation | S.E. |
|-------------------------------------|-------|-------|-----------------------|------|
| Body height (cms)                   | 166.7 | 4.88  | 2.92%                 | 0.63 |
| Body weight (kgs)                   | 51.4  | 6.75  | 13.13%                | 0.90 |
| Body surface area (m <sup>2</sup> ) | 1.57  | 0.09  | 5.66%                 | 0.01 |
| Resting pulse rate/min              | 77.7  | 10.68 | 1.37%                 | 1.38 |
| Fitness index                       | 80.4  | 8.29  | 10.30%                | 1.69 |
| Valsalva ratio                      | 2.03  | 0.34  | 16.74%                | 0.05 |

### DISCUSSION

Fitness index of  $80.4 \pm 8.29$  indicated a good physical built of the subjects (1). The lower fitness index obtained by some authors (5) may be due to sex differences of the subjects. In this study, all subjects were male students while those of Ganeriwal *et al* (5) were all females. The positive correlation between fitness index and height (Table II) explains to some extent why a stepping height of 18" instead of 20" has been preferred by some authors (4, 7). The positive correlation between fitness index and body weight is in agreement with Elbel *et al* (2). This may be due to lean body mass forming a greater percentage of the total body weight in the males. The -ve correlation between fitness index and resting pulse rate has been reported earlier too (4, 5). In trained persons having a high vagal tone such a correlation turns out to be quite significant (2).

The Valsalva ratio of  $2.03 \pm 0.34$  with a range of 1.16—2.72 compares well with Levin (9) who obtained a ratio of 1.50 or more in most of the subjects. We got a -ve insignificant correlation between Valsalva ratio and body height or weight, while with resting pulse rate the correlation was +ve but statistically insignificant. Since Valsalva ratio can change if a variation occurs either in denominator or in the numerator, it is difficult to explain this correlation with various body parameters. However, since body parameters alone do not always provide accurate information regarding physical fitness, it is necessary to determine the fitness index and Valsalva ratio to assess the same.

TABLE II: Correlation coefficient of fitness index and Valsalva ratio with body height, weight & resting pulse rate.

| Correlation coefficient of | Height | Weight | Resting pulse rate | Remarks                   |
|----------------------------|--------|--------|--------------------|---------------------------|
| Fitness index              | +0.046 | +0.012 | -0.131             | Insignificant correlation |
| Valsalva ratio             | -0.050 | -0.035 | +0.035             | Insignificant correlation |

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