VITAL CAPACITY AND ITS RELATION TO HEIGHT AND WEIGHT

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The study was conducted to find out the possibilities of predicting the vital capacity based on height and weight of an individual. In 15 *male and* 15 *female adults the height, weight and vital capacity were measured and nomograms were developed. In another* 15 *male and* 15 *female adults the height and weight were measured and the vital capacity for each individual was predicted using previously developed nomograms. Then the vital capacity was measured in these subjects using an expirograph. The predicted and obtained vital capacities were found to be within 1* $\pm$ 300 *c.c for all the subjects. Thus it was found that it would be possible to predict vital capacity based on height and weight.*

Measurement of air flow has gained importance in recent years, in screening, assessing and treating voice disorders. Importance of measurement of air flow rate in assessing and treating voice disorders has been stressed throughout the literature (Backett 1970 ; Vanden Berg, 1956 ; Hirano *et al.*, 1964 ; Isshiki and Van Leden 1964 ; Iwata and Van Leden, 1970 ; Jayaram, 1975 ; Nataraja, 1984 ; Ptacek and Sander, 1963 ; Yanagihara and Koike, 1967 ; Yanagihara *etal.*, 1966 ; Yangihara and Van Leden, 1967). Mean air flow rate and phonation duration have been found to be reliable indicators of air usage during phonation. Further mean air flow has been considered as related to pitch and intensity (Yanagihara *et al*, 1966), Isshiki, 1965 ;, Isshiki and Van Leden, 1964 ; Yanagihara and Koike, 1967). Phonation quotient is the ratio of vital capacity to phonation duration. This has been recommended by Twata and Van Leden (1970) as an indicator of mean air flow rate when mean air flow cannot be assessed directly. Hirano, Koike and Van Leden (1968) have shown tha there is a significant correlation between phonation quotient and mean air flow rate in normal adult subjects.

Rau and Beckett (1984) have made an attempt to assess the mean air flow rate based on the measurement of vital capacity and phonation duration. They have concluded that the measurement of vital capacity and phonation duration can be used to assess the mean air flow rate. The measurement of vital capacity requires an Expirograph or a Spirograph. Many speech and hearing clinics, may

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not be able to afford to have such an instrument. Therefore the quesiton of simple and inexpensive methods of aerodynamic masurement for determining the phonatioa quotient (permitting the estimation of' mean air flow rate) was paramount to this study.

Various factors have been reported to affect the vital capacity. Zemlin (1931) reported that the vital capacity varies with age, sex, height, weight, body surface area, body build, the amount of exercise and other factors Hutchinson demonstrated the relation between lung capacity and body size and weight. He indicated that the vital capacity and the body size are corrlated with arithmetical progression, and that the age and weight seem t_o be significant only in extreme cases of variation, the circumference of the chest having no immediate influence on the vital capacity.

It is, therefore, the purpose of this study to determine if then is any relationship between vital capacity and height and weight, and if a relationship exists, whether it would be possible to predict the vital capacity based on the height and weight.

Method

Part I : Fifteen males, age ranging from 18 years 1 month to 22 yeais and 15 females, age ranging from 17 years 2 months to 20 years 2 months, were considered for the study. All the subjects were students at the All India Institute of Speech and Hearing, and were normal.

The vital capacity was measured using an Expirograph. The subject was was instructed to take a deep breath and blow into the mouthpiece connected to the bellow of the Expirograph, in one breath, without permitting the air to leak out.

The air blown out was measured in millimetres on the graph paper of the Expirogiaph, which was then multiplied by 30, to give the vital capacity in cc. Three trials were given, and the highest value was considered as the vital capacity. The height and weight were also measured for each subject.

Using this data, a nomograph was constructed based on an earlier nomogram relating height, weight and vital capacity. The scales were adjusted, so that, majority of the subject's measured vital capacities coincided with the values arbitrarily placed on the scale. Two separate scales were constructed for males and females.

Part II : 5 males and 5 females, who were not included in Part I of this study, but of the same age group, were selected. The height and weight of these subjects were determined and the vital capacity predicted. Thevital capacity was then measured using the Expirograph

Results and Discussion

Part I: The nomogram construded was such that the measured vital capacity, namely the highest value in 3 trials, fell within ± 300 c.c. on the arbitrarily marked scale. All, but four females and three males, fitted well into the nomogram. Later enquiry into the history of these subjects revealed that of the 4 females and 3 males, 2 females, and 1 male showing lower vital capacity than expected on the nomogram reported of asthma or pulmonary infections and the two males showing higher vital capacities than expected were athletes.. The. remaining two subjects had no history accountable for their unexpected low vital capacities.

TABLE I. The predicted vital capacity and the obtained vital capacity in females

Sub. No.	Age	Height (cm)	Weight (kg)	Expected VC (cc) ± 300	Obtained VC (cc)
1.	21 years 3 months	146.88	44	1520	1700
2.	23 years 5 months	158.75	48	1850	1900
3.	20 years 4 months	162.5	47	1860	1600
4.	23 years 5 months	159..38	49	1875	1900
5.	19 years 5 months	158.75	41.5	1660	1650

TABLE II. The predicted vital capacity and the obtained vital capacity in males

Sub. No.	Age	Height (cm)	Weight (kg)	Expected VC (cc) ± 300	Obtained VC (cc)
1.	24 years 8 months	165	59	3200	2500
2.	19 years 2 months	171.25	62	3350	3300
3.	20 years	159.37	56	2925	2700
4.	19 years 7 months	160	63	3125	3100
5.	19 years 10 months	163.13	53.5	2900	3100

Part II: Thus it has been possible to determine the vilal capacity based on height and weight of the subject. These two measurements can be carried out with a scale and a weighing machine. *

Once the vital capacity is arrived at. it is easy to find out the phonation quotient, as the phonation duration can be measured using any time, piece or watch, The mean air flow rate can be derived from the phonation quotient

Thus, with simple, indigenously available instrument it is possible to assess the mean air flow rate and make objective diagnosis in case of Voice disorders.

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