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Effect of Aging on Ventilatory Function in Elderly Male Community–Dwelling Subjects

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Whether functional health status affords similar benefit to all older subjects has been examined in gerontology, and the universal applicability and utility of age groupings have been questioned. Persons living beyond age 75, old-old individuals, are likely to be differentiated from younger counterparts, young-old ones (65 to 74 years old). This paper represents the effect of age on ventilatory function : the percentages of both vital capacity and forced expiratory volume in one second in 102 aged men living in the community. The regression lines obtained in this investigation clearly showed the difference between the two groups. %VC and FEV1.0% of the young-old demonstrated 183.80-1.44*age and 193.05-1.57*age, respectively. On the other hand, those of the old-old showed 50.40+0.34*age and 66.63+0.15*age, respectively. It seems that aging by itself might be an absolute indicator of ventilatory function. This study may provide therapists with valuable and useful implications about ventilatory intervention for the older groups.

Key Words Elderly, Ventilatory function, Men, Community.

Introduction

The influences of aging on functional status have been examined extensively in the gerontological studies,^{1. 2)} indicating the physiological decay pattern for aerobic fitness and contributing factors of cardiovascular and respiratory function. Much attention should be paid to the notion that lung is vulnerable and its nor-

mal function is of vital importance to live a daily life independently in direct connection with the external environments.³⁾ Moreover, at different rates of the different life stages, each component of the respiratory system is affected by age.⁴⁻⁶⁾

It is characteristically represented that the lung elastic recoil is declining, PaO₂ is decreasing, the chest wall is getting stiffer, the inspiratory and expiratory muscles are loosing their elasticity and strength, and the respiratory centers are getting less sensitive.⁴⁾ In increased age various respiratory parameters such as residual volume, closing volume and functional residual capacity are increasing, while vital capacity, forced expiratory volume in one second, and the percentage of these factors are progressively declining.^{4,6)} However, it seems difficult to point out that the above-mentioned changes may not be attributed to any-

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thing but aging. Therefore studies have been conducted to clarify a matter of debate from various viewpoints; eg., gender⁵⁾ or environmental⁷⁾ differences. Chronological age appears to have been a convenient means to categorize aged subjects, although they are not classified into one homogeneous group.

Researches have a positive standing for the assumption that the older population is not a homogeneous class, and reflect the recognition that it is different from its younger counterparts, resulting in the categorization into young–old and old– old adults.⁸⁻¹⁰⁾ It is based on the fact that the old–old adults are exceptional in the life span, because they have lived beyond normal life expectancy as a sort of "biological elite".¹¹⁾ However, no information has been found about characteristics of ventilatory function between these two old groups.

The purpose of this present investigation was to describe the characteristics of the respiratory function in young-old (ages 65 to 74 years) and old-old (ages 75 years and over) adults⁸⁾ living in the community.

Materials and Methods

Subjects

The subjects selected in this study were 102 elderly men aged 65 and over, who lived alone or with family in the community. The population was divided into two groups by age; one was youngold group aged 65 to 74 with 48 adults (70.0 ± 2.7 years old), and the other oldold group aged 75 and over with 54 (81.5 ± 5.5 years old). Neither abnormal ECG tracings nor severe medical history was found. No abnormal physical and laboratory findings of ventilatory, metabolic, or neuromuscular diseases were observed, either.

The subjects were not impaired functionally, as measured by older adults' ability to engage in activities of daily living (ADL)¹²⁾ and instrumental ADL (IADL).¹³⁾ Nor did they get any physical and/or occupational therapy programs at Regarding life rehabilitation facilities. style characteristics¹⁴⁾ of the study population, no one smoked, nor partook in more than two hours per week of leisure time physical activity. This rating of perceived exertion corresponded to the range between 11 and 14 on Borg's category scale¹⁵, which indicates an activity level from "light" to "somewhat heavy". Their life habits were considered sedentary.

Methods

First, elderly participants were shown the spirometric apparatus (Minato Medical Inc.: as-300). At the same time the medical information about the testing was explained to them. Second, the procedure of the measurement was explained to the subjects who gave oral informed The measurement was carried consent. out in the sitting position. To exclude biases, simulated testing was repeated a few times to get accustomed to the pro-Each participant was advised to cedure. say "Stop", whenever it wanted during The test was always the measurement. carried out by the same operator; an occupational therapist. The subjects were instructed not to eat and drink anything for at least two hours prior to testing. A measurement was repeated, when the subjects could not perform the test according to procedure, or when the values of the parameters were apparently judged "wrong" or "abnormal" for the elderly.

The parameters measured in this study comprised percentage of vital capacity (%VC), a predictor of restrictive defect ventilatory impairment, and that of forced expiratory volume in one second (FEV 1.0%), a predictor of obstructive ventilatory impairment.

Statistical analysis

A 95% confidence level, that is p values less than 0.05, was considered significant and StatViewJ-4.5 software (Abacus Concept Inc., USA) was used for computations. Every participant's values of the



Figure 1. Scattergram of vital capacity rate (%VC) of all the male subjects, the young-old group (Young-Old) and the old-old group (Old-Old). It was characteristic that the regression line of the aged subjects showed a gradual decline (0.26% per year) with aging, but Young-Old presented a yearly decrease about four times greater than the subjects, whereas the change of Old-Old was inversely observed with an increase of 0.34% per year.

Aged subjects : %VC=100.22-0.26*age, R=-0.12, p=0.2493

Young-Old : %VC=183.80-1.44*age, R=-0.25, p= 0.09

Old-Old : %VC=50.40+0.34*age, R=0.11, p=0.45



Figure 2. Scattergram of one second forced expiratory volume rate (FEV1.0%) of all the male subjects, the young-old group (Young-Old) and the old-old group (Old-Old). The same trend as %VC was demonstrated, in which the regression line of the aged subjects showed a gradual decline (0.31% per year) with aging, but Young-Old presented a yearly decrease about five times greater than the subjects, whereas the change of Ŏld-Old was inversely observed with an increase of 0.15% per year. Aged subjects : FEV1.0%=104.53-0.31*age, R=-0.14, p=0.1680 Young-Old: FEV1.0%=193.05-1.57*age, R=-0.31, p=0.03 Old-Old: FEV1.0%=66.63+0.15*age, R=0.04, p= 0.75

parameters were displayed as scattergrams with age as independent variable and the absolute value of each parameter as dependent variable. Subsequently regression analysis was conducted and linear correlation coefficient was obtained.

Results

Figure 1 and 2 portray the scattered

individual values of %VC and FEV1.0% in a total of 102 male community dwellers, respectively. Each linear regression line of the two parameters are superimposed on each figure in the time course. Moreover, on the left and the right side of the figures divided by the age of 75 years the lines of the young-old and the old-old were displayed, respectively.

It was characteristically pointed out that aging exerted a clear influence on the variables of elderly men living in the community, as %VC and FEV1.0% gradually decreased at the rate of 0.26% and 0.31% per year (%VC=100.22-0.26* Age, R=-0.12, p=0.2493; FEV1.0%= 104.53-0.31*Age, R=-0.14, p=0.1676), respectively.

This declining trend was more sharply observed on the two variables of the young-old, indicating that %VC and FEV1.0% showed the yearly decremental rate of 1.44% and 1.57% (%VC= 183.80 -1.44*age, R=-0.25, p=0.09; FEV1.0%= 193.05-1.57*age, R=-0.31, p=0.03), respectively.

On the other hand, with regard to the two variables of the old-old, an average incremental rate of 0.34% and 0.15% per year was exhibited in %VC and FEV 1.0% (%VC=50.40+0.34*Age, R=0.11, p= 0.45; FEV1.0%= 66.63+0.15*Age, R= 0.04, p=0.75), respectively.

Discussiion

The current investigation showed that aging may exert some different influences on ventilatory function in male community-dwelling subjects, portraying the vformed regression lines at the age of 75 years; the inverse and positive correlations for young-old and old-old adults, respectively (Figures 1 and 2). The characteristics were exhibited in both % VC and FEV1.0%, identifying as a predictor of restrictive defect and obstructive ventilatory impairments, respectively.

One explanation for these findings of age-related difference might lie in the nature of the population selected in this investigation. That is, old-old subjects, defined as those aged 75 and over,8) represent a significant segment of the population group in terms of the uniqueness of their experiences as well as their numbers.¹⁾ This group is exceptional because its individual life is appreciably long beyond the average span of human life, and moreover old-old individuals would be categorized as a "biological elite".¹¹⁾ Other researchers specifically focusing on the functions of old-old subjects recognize the fact that they can be differentiated from their younger counterparts in terms of comprehensive health conditioning and the degree of helps they need in ADL and IADL. Their reports show the old-old as a group that may be comparable to the young-old and may not be always worse off than the young-old.^{8-10, 16)} Therefore more attention should be given to the view of oldold individuals that possibilities may emerge to mislead therapists in a clinical setting to simply understand aging as a continuity of declining functions. It clearly represents an inverse regression line in increased age (Figures 1 and 2).

It may be sure and it is of importance to note at this point that the ventilatory data collected and analysed were considered to be based on relatively healthy old-olds free from physical and cognitive impairments. However, it would be recognized as a reliable investigation consistent with the results that high perceived control in old-olds could exert some positive influence on health-related behaviors such as diet, exercise, or smoking.^{1,17)} The behaviors may result in contribution to overall health in a long life span. Moreover, feeling control would be demonstrated to have a direct connection with immune system functioning.¹⁸⁾

The present study should be considered a first step in demonstrating that our ventilatory analyses provided the different results at the age of 75 years. However, more future research is needed to further determine the age-related ventilatory function. Because some of the limitations of the study were addressed concerning a small sample of only males living in the urban community. Nevertheless, the results may be intriguing and instructive for therapists in the treatment

of young-old and old-old subjects. In general terms, our results represent evidence that ventilatory function of males living in the community could be differentiated between young-olds and oldolds and the age of 75 years would be an critical point, when interactions between aging and factors like functional health-related status would be determined.

In sum, data on the functions based on the age-related findings will provide therapists with a more accurate assessment of caring and rehabilitation, as the population beyond 75 years expands with much more varying health status from individual to individual.

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40

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