HIGH MOUNTAIN ACTIVITY HOLIDAYS IMPROVE FINGER MOTION MUSCLES` SPEED

ACTIVITĂŢILE MONTANE DE RECREERE ÎMBUNĂTĂŢESC VITEZA DE ACŢIUNE A MUŞCHILOR DEGETELOR

Friedrich Hainbuch[1]

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Abstract

Finger motion muscles` speed is a specific parameter revealing the condition of general state of muscle strength and reactions in old age and is a good indicator of whether the elderly can maintain their everyday living skills (ADL=activities of daily living) as well as participate in social contacts. For this reason lower muscle speed also signalizes reduced body muscle strength in general for elderly people.

Lower muscle strength correlates with markedly higher risks of falls and fractures with lessened independence and increased mortality.

This study will show that high mountain activity holidays of about 14 days –for increasing finger motion muscles` speed completed by twelve 65 to 69-year old men with heart disease does in fact contribute to a significant improvement in muscles` speed.

Cuvinte cheie: Viteza musculara a mânilor, vârstnicul, pacientul cardiac, prevenţie

Rezumat

Viteza musculară a mâinilor reprezintă un parametru relativ sigur pentru statutul general al forţelor musculare ale corpului. De asemenea reprezintă un indicator foarte important pentru capacităţile pacienţilor de a-şi putea îndeplini singuri atribuţiile zilnice (ADL). De aceea, o forţă redusă a musculaturii mâinilor este totodată un semn al slăbirii generale a musculaturii, în special la persoanele care depăşesc vârsta de 65 de ani.

Forţa musculară redusă este corelată cu o posibilitate mai mare de a cădea şi aceea de a suferi fracturi grave. Acest lucru are ca şi consecinţă reducerea calităţi vieţii şi dependenţa de ajutor. Nu în ultimul rând, acest fapt este unul din cele mai grave cauze ale mortalităţii!

Prin studiul prezent, doresc să demonstrez că este posibil chiar şi la o vârstă înaintată, ca numai după două săptămâni de activitate sportivă în munţi, musculatura mânilor să se îmbunătăţească semnificativ.

Introduction

ASHER (1947) and other researchers discovered that continuing immobility deteriorates muscles` speed and muscles` strength. [1]

Only MILES (1979) did some research on finger motion muscles` speed combined with studies of finger movement and extension, flexion and rotation.

In this study of 335 men aged 6-89 years and 528 women aged 8-94 years MILES attempted to construct an index of finger motion muscles` speed. In this study of the role of muscle speed in age-related decline MILES (1979) demonstrated that in fact finger motion muscles` speed declines over the course of aging, yet not at a linear rate, as hitherto believed but a parabolic rate. [2]

Almost to the third decade of life muscle speed increases. The highest finger motion muscles` speed for men is achieved in the fourth/fifth decade of life (between the ages of 30 and 45 years). Afterwards it decreases at a parabolic rate; in the fifth decade of life by about 5%, in the sixth by about 12%, in the seventh by about 25% and in the period between the ages of 80

[1] Associated Professor University of Oradea, Faculty of Geography, Tourism and Sport; Director of the Institute of Prevention, Rehabilitation and Sports at the Association of Sports for disabled people (Bonn),
Email: fhainbuch@t-online.de

and 89 years by about 34% (see fig. 1). Muscle speed also continues to decrease more and more the longer an illness lasts so that daily chores become progressively more difficult. [3]

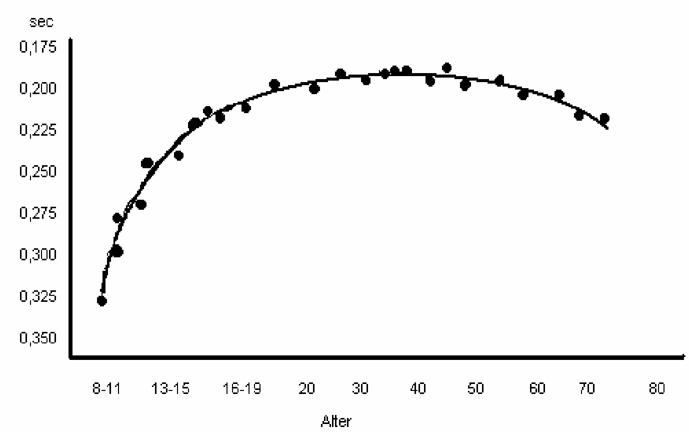

Fig. 1: Changes of finger motion muscles` speed during ageing by MILES (1979), S. 544.

Material and methods

After preliminary considerations, an age cohort of 65 to 69-year olds (dividing up cohorts by age is standard practice today) was prescribed the training program since this group was the largest of all cardiac sport groups available each week. Also optimal training continuity was possible because of the participants' reliability and the fact that many of them had known each other for years and they by and large still possessed the mental and physical alertness to resume physical activity.

As the group was composed exclusively of participants with CHD (Coronary heart disease), a specific group performance homogeneity was also provided for (100-120 W on an ergometer bike with a maximum pulse of 110-120 beats per minute).

Recruitment of participants was exceptionally easy. 12 male participants aged 65 to 69 (average age of 67.4) – all right-handed – were chosen from cardiac sports groups. Further criteria for ensuring group homogeneity were, as mentioned previously, cardiovascular impairment with/without by-pass or stent surgery as well as regular, daily medication (e.g. Macumar anticoagulant) and beta-blockers in some cases.

The screening and selection criteria excluded any neuromuscular or orthopedic dysfunctions, which could have possibly hindered grip strength performance.

All participants had to be willing to pay for the high mountain holidays. And they had to go on a hike every day for 5-7 hours in Wallis/Switzerland (at about 1700 – 2600 m altitude).

The Würzburg-based company Systems of Medical Technology (SMT) provided their Ageon vitality testing device on loan for this study.

Before starting the test series, all instruments were checked and calibrated. All 12 participants were tested again for tenderness when pressure was applied in the form of a firm handshake. An observer was always present at each measurement. This was true of the initial measurement as well as those taken after two days and two weeks.

Procedure. Initial test

Preliminary detailed explanation of the testing procedure –"introduction"-.

Upon assuming the standardized sitting position, three right-hand finger motion muscles` speed measurements were taken.

The test records the reaction time to a visual stimulus. It measures the time the subject needs to release a button pressed on the display. It then ascertains the time required to press a button situated about 10 cm away. This second part of the test thus records the muscular reaction time and indicates the muscle speed when tapping the finger.

The second measurement of the right hand for each participant was used.

Test after 2 days

Upon assuming the standardized sitting position, three right-hand finger motion muscles` speed measurements were taken.

The second measurement of the right hand for each participant was used; results report and brief discussion.

Statistics

Training and changes in performance are among the central phenomena in sports. It is the task of empirical research to test whether claimed changes can be substantiated. Mathematical statistical analysis also aims to determine whether it is possible to generalize the changes observed in samples. For measurement of change in general one of the key questions is whether changes in one trait that have been measured from a sample at different points in time are significant and thus capable of being generalized for the entire population. As the data obtained are characterized by an interval scale and normally distributed variables, the t-test for matched, dependent (correlating) samples is the suitable test for the proposed line of inquiry. Statistically, this involved the testing of one variable (finger motion muscles` speed, measured by visual reaction) for a group of participants under two different conditions, i.e. it involves the comparison of variables that were measured before and after the training phases.

Using the test statistic t it is possible to calculate whether the difference from the mean significantly deviates from zero.

The participants were first measured before starting (in Bonn), after 2 days in Saas Almagel (Wallis/Switzerland) and after two weeks.

To test for a significant difference from zero, the t-test is used. All statistical analysis was performed with the SPSS program, version 14.0.

Results

Prior to reviewing the individual test results, we shall briefly describe the participants' age structure and occupations. As mentioned previously, the study involved 12 (n=12) 65 to 69-year old men, three of which were 65, one 66 and one 67 years old, four 68 and three 69 years old.

The average age was 67.4 years. All participants were retired.

Beginning vs. 2-days at high altitude

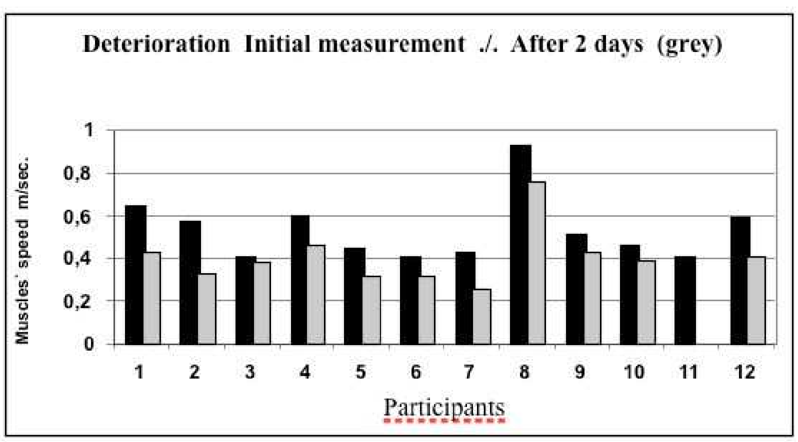

Fig. 2: Comparative deterioration between initial measurement and after 2 days

2-days at high altitude vs. 14-days at high altitude

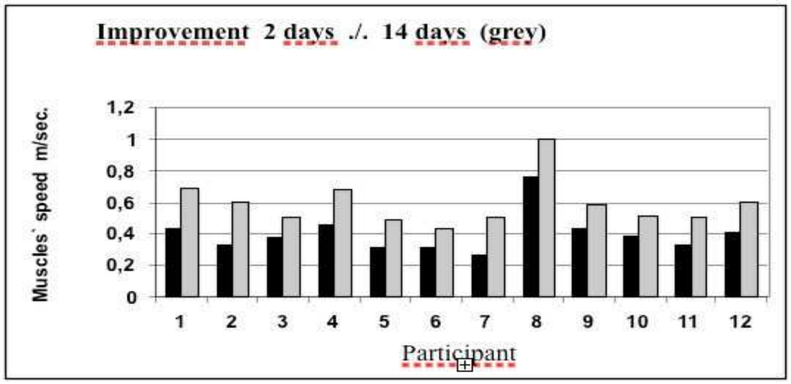

Fig. 3: Comparative improvement between measurement after 2 days and after 14 days at high altitude

Beginning vs. 14-days at high altitude

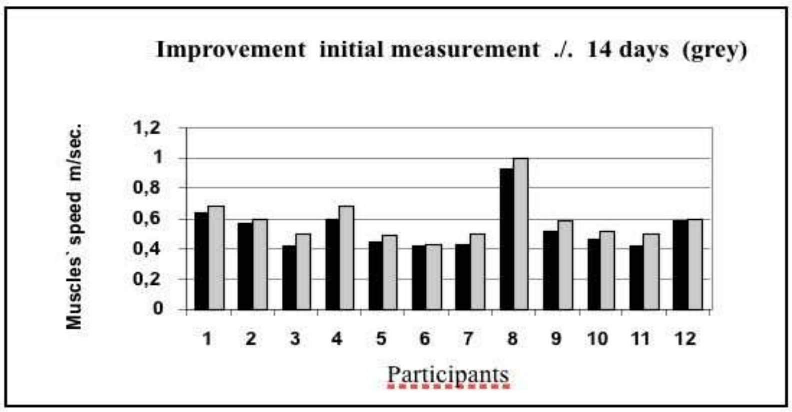

Fig. 4: Comparative improvement between initial measurement and after 14 days at high altitude

Conclusions

Determination of finger motion muscles` speed provides a relatively precise impression of the general state of muscle strength; it proves an indicator for the physical performance ability of aging persons. It also enables inferences to be made regarding the total muscle strength for third age people, correlates with diet and may be used for assessment of the course of disease. Manual skills presuppose sufficient finger motion muscles` speed for all activities of daily living.

Diminished ―muscle speed ‖is a sign of generally reduced muscular strength in third age people, and therefore strongly correlates with markedly higher risk of falls and of fractures, with lessened independence and increased mortality. It declines continuously and parabolically with age Due to the simplicity of the measuring procedure, performed in the past with a mechanical dynamometer (still preferred -today by some researchers), the test has been introduced in clinical diagnostics and in exercise physiology tests. Both the normal values used for the computer program as well as the research methods have been sufficiently verified.

Sufficient muscle speed is of vital importance for preventing and avoiding falls in senescence, in order to guard against dependency on physical care, loss of ability to help oneself and being bedridden, and to maintain quality of life as long and as independently as possible.

The present study concerns itself with improvement in muscle speed through high mountain activity holidays.

The participant group consisted of 12 65 to 69-year old men with CHD with an average age of 67.4 years.

The basic results can be summarized in four points:

1. A 14-day stay at high altitudes by 65 to 69 -year old men with heart disease is by no means precarious to their health and, indeed, contributes to a significant improvement in their finger motion muscles` speed. It at least delays the parabolic rate of decline in speed. Hence, such activity also contributes insubstantially to preventing falls in elderly people.
2. The correlation between values in the initial test and those after two weeks is significant.
3. The testing methods for the individually plotted statistical measurements allow us to state with an error probability of 1% that these improvements for the age group of 65 to 69-year old men is significant and thus capable of being applied to the population as a whole.

Comparisons of the calculated critical t-value give an error probability of 0.1%.

4. Participants' positive impressions of their training successes allow us to conclude that they also feel somewhat safer than they did before. All participants intended to continue physical activity.

References

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Table 1: Muscle speed measurements (cited in m/s)

Subject	*Start (50 m NN)*	*2 days at an altitude of 1700m*	*14 days at an altitude of 1700 m*	*After six months (50m NN)*
1)	0,64	0,43	0,69	0,69
2)	0,57	0,33	0,60	0,60
3)	0,41	0,38	0,50	0,49
4)	0,60	0,46	0,68	0,67
5)	0,45	0,32	0,49	0,49
6)	0,41	0,32	0,43	0,43
7)	0,43	0,26	0,50	0,49
8)	0,93	0,6	1,00	0,99
9)	0,51	0,43	0,59	0,59
10)	0,46	0,39	0,51	0,51
11)	0,41	0,33	0,50	0,50
12)	0,59	0,41	0,60	0,60