THE INFLUENCE OF HABITUAL PHYSICAL ACTIVITY ON FUNCTIONAL AND MOTOR ABILITIES IN MIDDLE AGED WOMEN

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Abstract:

Physical abilities decrease with age during the active, working phase of life. The purpose of this study was to assess the influence of physical load on functional and motor characteristics of middle aged women.

The sample comprised 333 women aged 31-50, all of whom were employed. For the purpose of the study, the sample was divided into two groups; younger group, age 31-40 (N=116) and older group, age 41-50 (N=217). The subjects were first asked to fill in the Baecke's questionnaire in order to calculate their work, sport and leisure-time indices, which represented the physical load during daily living. Then the anthropometric measurements were done and the subjects were tested for handgrip, sit-ups, vertical jump, balance, tapping and maximal oxygen uptake.

The results showed that younger subjects had significantly less fat tissue, better explosive and repetitive strength, as well as better results of tapping and VO_2max, which was understandable because of the age difference. When only more active older subjects were compared with less active younger subjects, most of the previously observed differences disappeared. In that case, the only significant difference was still present in VO_2max, which could be explained by the lack of aerobic component in older subjects' workout routine. It could be concluded that physical activity influences to a great extent the age-induced changes in physical abilities.

Key words: physical fitness, women, work load, characteristics

EINFLUSS DER ÜBLICHEN KÖRPERLICHEN TÄTIGKEIT AUF DIE FUNKTIONALEN UND MOTORISCHEN FÄHIGKEITEN BEI FRAUEN MITTLEREN ALTERS

Zusammenfassung:

Körperliche Fähigkeiten vermindern sich mit dem Alter während der aktiven Arbeitsphase des Lebens. Das Ziel dieser Studie war, den Einfluss der körperlichen Belastung auf die funktionalen und motorischen Fähigkeiten bei Frauen mittleren Alters zu bewerten.

Die Stichprobe umfasste 333 Frauen im Alter 31-50 Jahren; alle waren arbeitstätig. Zum Zweck der Untersuchung wurden sie in zwei Altersgruppen verteilt: die jüngeren von 31-40 Jahren (N=116) und die älteren von 41-50 Jahren (N=217). Die Frauen wurden zuerst gebeten, den Baeckes Fragebogen auszufüllen, um ihre Arbeits-, Sport- und Freizeitindexe auszurechnen, die die Körperbelastung im täglichen Leben darstellen. Danach wurde das anthropometrische Messen durchgeführt, wobei die Stichprobe auf den Handgriff, das Aufsitzen, den Hochsprung aus dem Stand, das Gleichgewicht, das Tappen und die maximale Sauerstoffeinnahme getestet wurden.

Die Ergebnisse zeigen, dass jüngere Frauen über bedeutend weniger Fettgewebe, sowie über bessere Explosiv- und Repetitivkraft verfügen. Sie haben auch bessere Ergebnisse beim Tappen und VO_2-max erzielt, was wegen des Altersunterschieds auch verständlich ist. Vergleicht man nur die mehr aktiven älteren Frauen mit den weniger aktiven jüngeren Frauen, verschwinden die meisten vorher beobachteten Untereschiede. In diesem Falle wurde der einzig bedeutende Unterschied noch beim VO_2-max bemerkt, welcher durch die mangelnde aerobische Komponente beim gewöhnlichen Üben der älteren Frauen erklärt werden kann. Die Schlussfolgerung kann gezogen werden, dass körperliche Tätigkeit die altersbezogene Veränderungen körperlicher Fähigkeiten zum grossen Maßen beeinflusst.

Schlüsselwörter: körperliche Form, Frauen, Belastung

Introduction

Functional and motor abilities decrease with age. An important role in that process is attributed to sedentary lifestyle. The negative correlation between sedentary lifestyle, fat tissue percentage and the decrease in aerobic capacities was confirmed (Jackson et al., 1996). According to Schilke (1991) functional characteristics decrease by 0.75-1.00% every year after the age of thirty. Strength and especially explosive strength show significant decrease in the fifth and at the beginning of the sixth life decade. Nakamura et al. (1990) compared biological age of women with their fitness age. A high correlation was found

between the results of the 5 motor abilities and 18 parameters representing biological functions of the body. The decrease of the muscular strength with age is caused mostly by atrophy and replacements in muscular fibres (Hakkinen et al. 1994), while the poorer performance on flexibility tests is due to the increase of collagen and the decrease of elastic fibres in connective tissue. However, the improvement of flexibility by exercise was proven to be possible till the old age (Chapman, 1972). Also, according to Ekdahl et al. (1989) the age was the most dominant factor predicting the results of balance testing. Additionally, the speed of hand tapping becomes slower with age as the degenerative processes within the CNS occur. (Kauranen and Vanharanta, 1996).

Considering the important role of physical activity on functional and motor abilities, the importance of proper measuring of habitual physical activity had become the subject of many scientific papers like Montoye's (1971) or Wilson's (1986). More recently, Blair et al. (1985) published the method based on a 7-days recall of physical activity and Haskell et al. (1993) considered the heart rate as the possibility to quantify the physical load. One of the best methods for evaluation of the habitual physical activity is Baecke's questionnaire (Baecke, 1982). In the study with double-labelled water Baecke's questionnaire turned up to be very reliable and it correlated to a great extent with energy expenditure during daily living (Phillpaerts et al., 1998).

The purpose of this study was to determine the influence of physical activity on functional and motor abilities in middle-aged women. A comparison of active women in the fifth decade was made with less active women of fourth life decade in order to prove the role of the physical activity on preservation of physical abilities.

Materials and methods

The sample comprised healthy working women aged 31-50 years. The total sample (N=333) was divided into two groups, the younger group aged 31-40, (N=116), and the older group aged 41-50 (N=217).

Before the testing procedure, the subjects underwent a medical examination. The subjects with chronic illnesses and specially hypertensive subjects, were excluded because of the risk for their health. The subjects were tested for repetitive strength (sit-ups), tapping, handgrip, flexibility (sit & reach), explosive strength (high jump), balance (one-leg balance test) and maximal oxygen uptake (Astrand test). The percentage of fat tissue was determined from three skinfolds. All tests were chosen among the EUROFIT battery of tests (Oja and Taxworth, 1995).

The variables representing physical loads and habitual physical activity were calculated from Baecke's questionnaire (work index, sport index and leisure-time index). The minimal possible value of the indices was 1.0

Table 1: Differences in motor abilities and maximal oxygen uptake between the groups divided only according to the age

	Mean ± SD (age 31-40)	Mean ±S D (age 41-50)	p
N	116	217	
fat tissue (%)	23.64± 6.32	26.30± 6.00	0.0001*
high jump (cm)	31.56 ± 8.21	29.04 ± 7.37	0.0051*
hand grip (kp)	36.53 ± 5.75	35.96 ± 6.41	0.4781
sit-ups (n)	12.42 ± 4.66	10.92 ± 5.25	0.0105*
flexibility (cm)	7.61± 7.44	6.73± 15.01	0.5559
balance (trials)	6.26± 9.12	6.57± 8.20	0.7502
tapping (n /15s)	26.35 ± 4.98	24.91 ± 4.77	0.0111*
VO_2 (ml/kg/min)	28.78 ± 6.25	23.97± 5.58	0.0001*

** the asterisk represents the significant difference*

that represented the minimal physical load, while the value 5.0 represented the maximal physical load.

Results

First, the differences between the whole sample of younger subjects and the whole sample of older subjects were analysed no regardlesst of the values of load indices. The *t*-test results of differences between the younger and older group showed that there was a significant difference in fat tissue, high jump, sit-ups, tapping and maximal oxygen uptake (Table 1). The younger group had better results, which was expected and understandable with regard of the age.

As the purpose of the study was to determine whether the subjects who participate more in sport activities had better physical abilities, the sample was divided. Only the subjects with sport index below 2.50 were included in the younger group, whareas the older group consisted only of the subjects with a sport index higher than 2.50. The above mentioned division was done in order to accentuate the differences in sport activities between the subjects. The results showed that in this case, the previous differences in motor abilities had diminished. The still remaining difference between the groups was only in the maximal oxygen uptake (Table 2).

It is worth mentioning that the comparison of the functional and motor characteristics was also done in a way that the younger group consisted of the subjects whose work indices were below 2.50 and the older group of subjects with work indices were above 2.50. In that case, the differences shown in Table 1 did not diminish. The same situation was recorded in te case when the group were divided with regard to the leisure-time index, which meant that the physical load at work place and in free time without sport activities did not differentiate between the subjects with regard to their abilities.

Discussion and conclusions

The results of this study (Table 2) show that there existed no significant difference between the older active and the younger inactive group. The lack of differences should be explained by a better motor unit recruitment and a decrease in autoinhibition of the CNS as the result of the physical activity. Frontera et al. (1988) showed that strength training in older subjects still leads to significant muscle hypertrophy conditioned by the intensity and duration of the strength training sessions. Physical load at work place (work index) showed no influence on the preservation of strength characteristics that could be explained by inadequate intensity and duration of the impulses. As preserved strength and balance prevent physical disabilities and dependence on other people's help in the older age (Rantanen et al., 1999)

Table 2: The differences in motor abilities and maximal oxygen uptake between the groups divided according to the age and sport index (SI)

	Mean ± SD age 31-40, SI<2.50	Mean ± SD age 41-50, SI>=2.50	p
N	88	64	
fat tissue (%)	24.03 ± 6.27	25.99 ± 6.00	0.1518
high jump (cm)	29.97 ± 7.67	31.55 ±9.56	0.4592
hand grip (kp)	36.43 ± 6.03	34.95 ± 6.23	0.1001
sit-ups (n)	12.21 ± 4.83	11.11 ± 5.08	0.9182
flexibility (cm)	6.82± 7.46	6.74± 9.13	0.5470
balance (trials)	7.00± 9.71	6.15± 7.47	0.6392
tapping (n /15s)	25.24 ± 4.28	24.70 ± 4.76	0.9183
VO_2 (ml/kg/min)	28.20 ± 6.36	24.68 ± 5.37	0.0153*

** the asterisk represents the significant difference*

it is of great importance to improve this abilities by participating adequate physical activities in the earlier stages of life.

The strength of handgrip is highly influenced by body height and body mass as long as the women are in reproductive age (Cauley et al., 1987). As most of the subjects in the older group were still premenopausal, it explains the lack of differences in hand grip between younger and older subjects.

Jackson et al. (1996) established the annual decrease rate of 0.537 ml/kg/min of maximal oxygen uptake. If we consider the population of this study, the results confirm the similar annual change. The changes in maximal oxygen uptake are mostly related to the sedentary lifestyle. The improvement of the aerobic capacity is possible till the late age, if an appropriate aerobic type of training is practised regularly (Neder, 1999). In this study, the significant difference in oxygen uptake between the older and the younger group is still observed even when active older and less active younger subjects were compared (Table 2). The reason lies in the fact that older group did not have adequate aerobic workout included in their sport activities. The aerobic programes available in fitness centres are usually of very high intensity (step aerobics, aerobics, etc.) and women over 40 rarely choose to participate in them. They prefer the programes of lower intensity such as callanetics, stretching, strength training etc., that explain the preservation of their motor abilities and no improvement of the aerobic capacity. With an aerobic workout appropriate for their age the older group could also improve the maximal oxygen uptake.

To conclude: the preservation of the functional and motor abilities during life implies a better quality of life. Only physical activity such as sports-recreational activity with adequate frequency, intensity and duration contributes to the improvement of functional and motor characteristics. It could be concluded that active older subjects are biologically younger for the whole decade according to their motor abilities. The lack of aerobic component in older subjects' workout results in inadequate maximal oxygen uptake response.

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