

SEDENTARY LIFE - SOURCE OF MULTIPLE HEALTH PROBLEMS

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Summary

Sedentary life-styles are getting more and more common in advanced but also in developing countries, with the progress of production and transportation technologies. People are sitting at work, during commuting and then at home. The use of computers both at work and home is increasing, as also is watching television during leisure time. The traditional use of the musculoskeletal system has diminished. At the same time, the health problems of the musculoskeletal and cardiovascular systems have increased.

Most presently used chairs have a rather short history. They have been designed to look good, but the designs are not necessarily based on an understanding of human physiology. They promote passive sitting. Sitting on conventional chairs forces the flattening of lumbar lordosis. Static sitting may be harmful not only for the back but also for blood and fluid circulation in the legs.

The sitting career starts at school. In one school the students received tables and chairs which were adjustable, whereas in a control school students continued to use non-adjustable traditional tables and chairs. When the students started to use their adjustable tables and chairs, the muscle tension levels fell statistically significantly in their trapezius and back muscles. This intervention corrected the posture, when the students were sitting in their new units. Their carriage (kyphosis, scoliosis, lordosis) was also corrected, when they were standing. The students reported also that they had less headache and back pains. An ergonomic approach in furniture planning of school classes, as well as of all work places, with the possibility of individual adjustment of

tables and chairs is necessary. Passive sitting should be replaced by dynamic sitting and new ways of doing light work.

A sedentary life tends to lead to overweight and obesity. Gaining weight increases load on the joints, but perhaps more important are the metabolic problems, which may lead to adult type diabetes—even in childhood—and to increase of cardiovascular morbidity.

1. Introduction

The recent past has essentially changed the life-style of most people in advanced countries. About 100 years ago perhaps nine out of ten did hard work with their muscles, but now perhaps only one. Chairs have proliferated in work places. Urbanization, automation and the introduction of information technology have increased the use of machines and computers, and machines also carry people and goods. Most of today's populations in well off countries spend their time sitting at work, commuting to and from work and then also at home watching TV and computer screens.

In developing countries, people still, however, work using traditional techniques and their own muscles. When people have had time, sitting styles have varied in different cultures. In Japan, traditional sitting is still on the floor in many homes, traditional restaurants and hotels. Sitting on the floor was also the rule among American Indians. In Africa, many people traditionally sat on their heels or on kiti chairs, which are very low, and legs are directed obliquely forward and sideways.

Previously in western countries, most work used to be physically demanding in fields and forests and required a lot of walking, i.e. dynamic muscle activity. The alternative, riding on horseback—and even driving carriages on poor roads—both required physical activity and the swaying made physical activity rather dynamic. Posture when people are riding on horseback is similar to the posture of standing and walking. A century ago, even in offices, clerks would stand to do their paper work. Their tables were high and had an inclination to facilitate writing. Now the norm is sitting. Everyday chairs and benches have not been designed to help the spine to maintain its normal curvatures (see Figure 1). More and more of the work is done indoors, and sitting on cushioned chairs. The history of chairs in their present form is thus quite short. The physiology of all these postures is significantly different. The differences affect not only the legs but also also the back.

Computer-aided work is increasing not only in offices but also in most other occupations. Computer work requires people to maintain the same posture over a period of a few hours, and that fixes the trunk, head and arms in the same posture for long periods of time. Just a few small muscles in hands make small, dynamic movements with keyboard or mouse. Thus large muscle masses are statically activated only to make the small movements possible in the fingers. Muscle pains due to poor oxygen supply and nutrition with poor removal of metabolites like lactic acid in large muscle masses, are therefore increasingly common.



Figure 1. A set of office chairs currently used; the chair on the right is a saddle chair, one of the latest ergonomic designs.

Mental pressure may tense the muscles over a period of several hours. Musculoskeletal problems of the neck shoulder region and low back are thus common, due to both poor fitness and mental strain. Musculoskeletal problems, which are also related to headache and various pains, are now one of the most common reasons for work absenteeism.

For at least 100 years in Finland, children have been learning and sitting for much of their school years, on wooden benches. Over the last 40 years, the sitting time has been extended to 12 years. Today about two decades of sitting are needed to get a vocational institute or university degree.

Every second year the health of students is recorded in Finnish schools. Recent interviews have documented an increase in health problems, and one of the main reasons has been found to be school tables and chairs. School furniture forces the students to adopt poor sitting postures. It is to be expected that school furniture will have a big influence on the general carriage of the body. Repeated sitting for several hours in such postures may affect also the growth of the spine and paraspinal tissues. Follow-up studies showed that the aerobic fitness of the students decreased.

Computers have increased in numbers not only at work, but also in schools and homes. A lot of sitting and poor postures probably leads to poor life-styles and contribute to increased body weight and poor fitness.

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Biographical Sketches

Reijo Koskelo, M. Health Sc. was born 1950 in Rautavaara, Finland. He obtained his Master of Health Sciences (Sports Medicine) in 1997 at the University of Kuopio, Finland. Since 1997 he has served as a researcher at the Department of Physiology, University of Kuopio, Finland (planning and realization of projects on ergonomics of workstations and school tables and chairs, co-operation networks between the university, vocational institutes and companies). His PhD dissertation on health of high school students and adjustable school tables and chairs is under evaluation. His special interests are applied physiology, sports medicine, ergonomics and muscle metabolism.

Nina Zaproudina was born 1963 in Karelia. She graduated 1988 from the First Medical Institute of Leningrad, Russia and worked for twelve years as a general practitioner. She is currently an assistant of the Department of Physiology, University of Kuopio, Finland and a postgraduate student. The topic of her investigations is use of infrared thermography in the diagnostics of musculoskeletal disorders and evaluation of muscle fatigue. She is married and has two children.

Osmo Otto Päiviö Hänninen, Dr. Med. Sci., Ph.D. Professor of Physiology, Chairman of the Department, University of Kuopio, was born in 1939 in Lahti, Finland. He studied at the University of Helsinki and University of Turku, Finland where he obtained a Master of Sciences (Biochemistry) in 1962, Licentiate of Medicine (M.D.) in 1964, Doctor of Medical Sciences (Dr.Med.Sci.) in 1966, and passed his dissertation in biochemistry for a Ph.D. in 1968. He has also studied genetics. He has been a specialist in sports medicine since 1986. He has served as Research Assistant to Prof. K. Hartiala 1962–1964, Assistant of Physiology 1964–1965, Laborator of Physiology 1966–1967, Docent of Physiology from 1967, and Associate Professor of Biochemistry 1969–1971 in the University of Turku. He was Acting Professor in the Planning Office 1971–1972 and from 1972 he has been Professor of Physiology and Chairman of the Department of Physiology at the University of Kuopio. He was Vice-President (1972–1979) and President (1981–1984) of the University of Kuopio. He served as Visiting Professor of Physiology, Shanghai Medical University, China in 1991–1992 and Sun Yatsen Medical University, Guangzhou, China, in 1998–1999. He became a Foreign Member of the Russian Academy of Natural Sciences in 1994, and was Secretary General, International Council for Laboratory Animal Science, 1988–1995. He was President of Societas Physiologica Finlandiae 1990–1999, and has been President of the International Society for Pathophysiology since 1994 and Treasurer of the International Union of Biological Sciences from 1997.

His special interests in research are biotransformation and adaptation to chemical loading, biomonitoring of toxicants, comparative biochemical toxicology; muscle metabolism and function; and ergonomics.

He has written 266 papers for refereed journals, 72 articles published in proceedings, and 55 reviews, as well as 30 books and book chapters. He serves on the editorial board of four international journals and is currently the European Journal Editor of *Pathophysiology*.

Of his postgraduate students (32 in biotransformation, 27 in muscle metabolism and physiology, and 5 others), 12 serve as professors in China, Finland, Greece, Sweden, and the USA.