

EUFIC-ÜBERSICHT

REFERENCE PAPER OF THE EUROPEAN FOOD INFORMATION COUNCIL

... Physical activity and health (English only) ...

1. INTRODUCTION

The quality and quantity of the food and drink we consume has attracted a great deal of attention. Less significance has been attached to the volume and nature of calories we expend through physical activity. However, investigation of the evolution of the human form shows how closely they are bound. The human as hunter-gatherer developed an efficient endurance system, an ability to produce powerful energy output when required, and a capacity for energy storage. Energy had to be expended to seek food which was often spread over wide distances. Over a period of several million years this helped humans to be highly successful survivors.

It is ironic that the pace of change in the environment in developed countries in the last century has left the human form poorly prepared. Humans are maladapted to a life where there is plentiful high energy dense food. Without the need to physically seek food, there is no pressing need to expend large amounts of energy. Advances in technology through motorised transport, automation, and labour-saving equipment around the home, in the workplace and the shopping environment have further reduced the need for physical work. Cheap and accessible electronic entertainment makes the home an increasingly attractive and comfortable place.

As a result, it is much easier to take life easy and more difficult to find the time and motivation for maintaining physical activity and fitness levels. The result is that around 70% of populations in westernised countries are insufficiently active for optimal health and energy balance (Sports Council/Health Education Authority, 1992; US Department of Health and Human Services, 1996).

2. DEFINING PHYSICAL ACTIVITY AND FITNESS

It is important to establish what we mean by physical activity and its related terms. Physical activity refers to all energy expended by movement. The major contributors are everyday activities that involve moving the body around, such as walking, cycling, climbing stairs, housework, and shopping, with much of it occurring as an incidental part of our routines. Fidgeting may be important in overall energy expenditure but is not usually included.

Exercise, on the other hand, is a planned and purposeful attempt, at least in part, to improve fitness and health. It might include activities such as brisk walking, cycling, aerobic dance, and perhaps active hobbies such as gardening and competitive sports.

Unlike physical activity and exercise, which are behavioural processes, physical fitness is a set of attributes, such as strength or stamina, that determine capacity for physical activity. Fitness is largely the result of our levels of physical activity, and programmes of exercise can be devised to improve specific aspects of fitness. Fitness, however, is also a result of genetic factors, with some lucky individuals having a natural capacity and physique to excel at physical challenges.

This becomes more noticeable in competitive sports, such as distance running, or lifting weight where the best performers have a genetically superior body that is in peak condition through vigorous training. Evidence to date, however, suggests that it is regular participation in physical activity rather than any inherited component of fitness that is related to health (Hein, Suadicini, & Gyntelberg, 1992). Those individuals who feel protected by their past athletic achievements, unfortunately appear to be misled! Similarly, those who feel that they cannot benefit from exercise because they are not athletic or 'sporty' are also mistaken.

Definitions related to physical activity

Physical activity	All bodily movements that result in energy expenditure. This includes daily routine activities such as household jobs, shopping, work.
Exercise	Planned and structured repetitive movements designed specifically to improve fitness and health.
Sport	Physical activity which involves structured competitive situations governed by rules. In many European countries, the term sport is used to include all exercise and leisure time physical activity.
Physical fitness	A set of attributes such as stamina, mobility, and strength that relate to ability to perform physical activity.

3. WHAT ARE THE COSTS OF INACTIVITY?

The human form is clearly designed for physical activity so perhaps we should not be surprised that in a chronic sedentary state it shows signs of failure. In the past 20 years or so extensive epidemiological and experimental evidence has established that inactivity causes illness and premature death. Recently, Lee and Skerrett (2001) reviewed 44 prospective investigations and identified a consistent dose-response relationship between physical activity and/or aerobic fitness and all-cause mortality. Only five investigations failed to show an effect.

Those who maintain a reasonable amount of activity, particularly across the middle and later years, are twice as likely to avoid early death and serious illness (Berlin & Colditz, 1990; Powell et al., 1987). This is on a par with avoidance of smoking, hypertension and dyslipidemia, leading to the recognition of inactivity as the fourth primary risk factor for heart disease (see



Figure 1). Further good news suggests that the process of becoming fitter produces these benefits (Bijnen et al., 1999; Blair et al, 1995; Erikssen et al., 1998). It appears that it is never too late to make some changes and experience these positive outcomes.

Not only does disease and early death cause suffering to victims and their friends and family, but there are also high economic costs in terms of sickness, absence from work and health care. Most of the estimates have been conducted in the USA, where the population attributable risk caused by inactivity as been put at 18% for heart disease at a cost of \$24 billion (1995 \$ value) and 22% for colon cancer at a cost of \$2 billion (Colditz, 1999). Average medical costs for active people are 30% lower than inactive people. In Britain the cost of obesity, which is around 20% of the population and at least partially a result of inactivity, has been estimated at £500 million, causing 18 million days of sickness absence.

4. WHAT ARE THE BENEFITS OF PHYSICAL ACTIVITY?

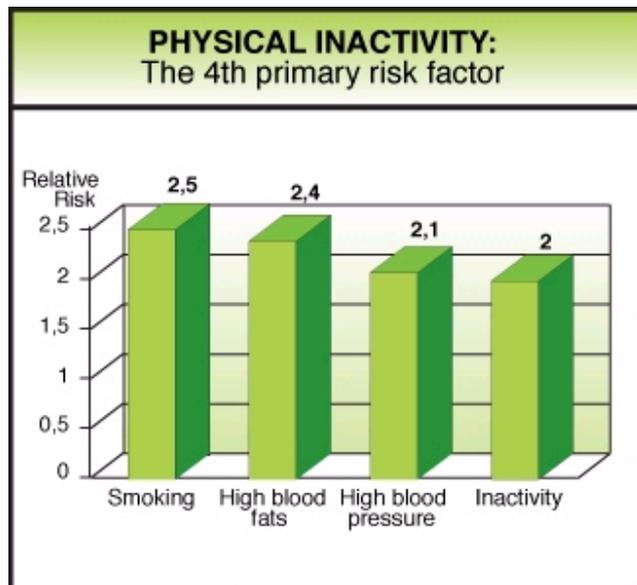
Physical activity has both preventive and therapeutic effects across several diseases and conditions.

4.1 Coronary heart disease and stroke

Coronary heart disease (CHD) remains the leading cause of death in Europe. Maintaining an active lifestyle, and at least a moderately high level of aerobic fitness, halves the chances of either dying from or contracting serious heart disease. There is a clear dose response relationship, with the change from sedentary to moderately active producing greatest health benefits. Regular walking produces a reduction in CHD events (Sesso et al., 2000). Similarly, cycling to work (Andersen et al., 2000) active commuting to work (Vuori et al., 1994), and four hours of recreational activity per week (Wannamethee et al., 2000) or at least 800 kcals of leisure time activity per week (Haapanen et al., 1996) are all associated with reduced risk.

Physical activity is also useful for recovery from heart disease with exercise-based cardiac rehabilitation programmes effective in reducing further deaths by 27% (Jolliffe et al., 2001). The preventive and therapeutic effects of physical activity on stroke are less clear with studies showing inconsistent results.

FIGURE 1: Physical inactivity as a primary risk factor for CHD



Figures taken from Powell et al., 1987

4.2 Obesity

Obesity, more than any other disease state, appears to be a direct result of recent changes in environmental conditions that involve easy access to motorised transport, labour-saving devices, home screen entertainment, and cheap, high density food. The incidence of obesity has trebled in a 20 year period to the point where 20-25% of adults are clinically obese (Body mass index >29.9). This constitutes an epidemic and is reflected in many developed countries as well as most developing nations. The evidence that reduced physical activity has been a determinant of this increase is stronger than the evidence for increased energy intake (Prentice & Jebb, 1995).

There are several prospective studies that indicate the benefits of an active and fit lifestyle for the prevention of obesity. Activity at least seems to attenuate weight gain typical of the middle years (Di Pietro, 1999; Fogelholm et al., 2000). Exercise produces modest weight loss in those already overweight or obese, adds to weight loss when combined with calorie restricted diets, and improves body composition by preserving muscle tissue and increasing fat loss (Garrow & Summerbell, 1994; Wing, 1999). Physical activity is also effective in reducing high risk abdominal or visceral fatness (American College of Sports Medicine, 2001). Furthermore, those who maintain exercise are much more likely to sustain any weight loss long term than those who rely on dietary management alone (Wing, 1999).

Perhaps the greatest benefit of physical activity for the obese is its impact on health risk profile. Blair and Brodney (1999) reviewed observational studies and concluded that obese people who managed to keep active and fit reduced their risk of heart disease and diabetes relative to non-obese levels. This important data would suggest that it is not unhealthy to be fat as long as you remain fit. It also puts into question whether obesity is more hazardous than inactivity.

4.3 Adult onset diabetes

The incidence of Type 2 diabetes has risen rapidly. This is often attributed to the concomitant rise in obesity. However, there is strong evidence to show that inactivity may be a causal factor. Prospective studies indicate a strong dose response negative relationship between activity and contraction of diabetes, with risk reductions of 33-50% recorded for active groups (Manson et al., 1992). Walking, cycling and active hobbies such as gardening are associated with lower risk but it is likely that the greatest gains are made with moderate to vigorous activity (Lynch et al., 1996). The strong relationship is plausible as the muscle is a critical site for glucose metabolism.

Exercise has been shown to delay or possibly prevent progression of glucose intolerance to the diagnosis of diabetes (Pan et al., 1997). Exercise also has benefits for those who are already diagnosed with diabetes. A small number of well designed studies have also shown that an activity programme of walking or cycling, carried out three times a week for 30-40 minutes, is able to produce small but significant improvements in glycaemic control in diabetics.

4.4 Cancer

Cancer remains a leading cause of ill health and death. Involvement in occupational or leisure time physical activity carries a reduced risk of mortality from cancer (Thune & Furberg, 2001). Moderate to vigorous activity appears to be most beneficial. The strongest protective effect is for colon or colorectal cancers (Lund Nilssen & Vatten, 2001) producing a 40-50% risk reduction.

The population-attributable risk for inactivity has been estimated at 22% in the USA at a cost of \$24 billion (1995 figures) (Colditz, 1999). Physical activity also helps prevent lung cancer with a 40% risk reduction evident after control for smoking and other lifestyle factors. Similarly there are benefits for breast cancer but not prostate or testicular cancer.

There has been less attention paid to the impact of exercise in the treatment or management of cancer. Although there is as yet insufficient evidence to suggest that progress of the disease can be slowed by exercise, it does appear to have benefits for life quality including improved psychological well-being and reductions in fatigue and nausea.

4.5 Musculo-skeletal health

Less attention has been paid to muscular-skeletal disorders and diseases such as low back pain, osteo-arthritis and osteoporosis, yet they are a major cause of human suffering, reduced life quality and lost work productivity. Exercise training produces stronger muscles, tendons and ligaments and thicker more dense bone. This improves functional capacity and allows greater independent living in older people. Physical activity programmes designed to improve muscular strength also helps older adults to maintain balance (Snow, 2000) and this in turn can produce a reduction in falls. It can be effective in preventing low back pain and also reduces reoccurrence of back problems (Vuori, 2001). At this point it is not clear which type of exercise works best.

Physical activity has not been shown to prevent osteo-arthritis but walking programmes have indicated important beneficial effects. Exercise can reduce pain, stiffness and disability and improve strength, mobility and overall ratings of life quality (Hartman et al., 2000).

Exercise training involving, weight bearing moderate to vigorous activity, can increase bone mineral density and bone size in adolescents, help maintain it in adults and slow decline in older age. This in turn prevents or delays the onset of osteoporosis but cannot reverse osteoporosis once it has developed. The effect is specific to those bones loaded by the exercise (Vuori, 2001).

4.6 Mental well-being

The case for physical activity and health has largely been made on the evidence for its prevention of diseases such as CHD, cancer, obesity and diabetes. The World Health Organisation has estimated that mental illness, largely in the form of depression and anxiety, will be the leading cause of disability and a major cause of loss of life by the year 2020. In addition to increased incidence of serious mental illness there is concern for the increasing numbers of 'worried well' who suffer chronic or recurrent mild to moderate symptoms. Several well designed studies have now shown that physical activity can reduce clinical depression (Mutrie, 2000).

Exercise can be as effective as traditional treatment such as psychotherapy. It can offer a cheap alternative for those who do not wish to rely on medication, and it brings extra physical health benefits to a population who are at elevated risk for several diseases. A few prospective studies indicate that maintaining physical activity over several years can also provide a reduced risk (up to 22%) of subsequent depression (Dunn et al., 2001).

Physical activity also improves psychological well-being in those who are not suffering from serious mental disorders. Several hundreds of studies (see Biddle, Fox, & Boutcher, 2000) have documented improvements in subjective well-being, mood and emotions, and self-perceptions such as body image, physical self-worth and self-esteem. Furthermore, both single bouts of activity and exercise training reduce anxiety and improve reactivity to stress, and also improve quality and length of sleep in those with or without sleep disorders.

Physical activity is particularly helpful for older people as it reduces risk of dementia and Alzheimer disease (Laurin et al., 2001) and improves executive aspects of mental functioning such as planning, short-term memory and decision making (Kramer et al., 1999). Clearly, physical activity has tremendous potential to improve quality of life throughout the lifespan.

5. RISKS OF PHYSICAL ACTIVITY

The risk of sudden cardiac death is elevated by five times during vigorous exercise for fit individuals and 56 times for unfit individuals. Any risks accompanying exercise are far outweighed by the benefits and the reductions in disease risk that fitness brings (Vuori, 1995). There is also an increased risk of injury, particularly to feet, ankles and knees, while taking part in exercise or vigorous sports.

Finally, much press attention has been about the prospect of exercise addiction, whereby people become 'hooked' on exercise to the detriment of other aspect of life such as work and social relationships. Although a syndrome of exercise dependence has been identified, it is extremely rare and more likely to accompany other mental problems such as anorexia nervosa, excessive neuroticism and obsessive-compulsive disorders (Szabo, 2000).

6. PHYSICAL ACTIVITY RECOMMENDATIONS

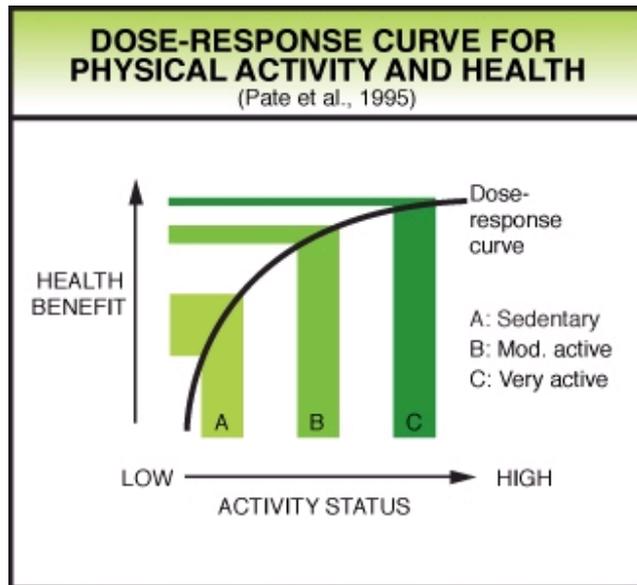
Morris (1994) recently suggested that physical activity promotion provides today's best buy in the health market place. Sedentary living is becoming increasingly widespread and its toll is already evident. When people become more active, they reduce their risk of early death from heart disease, some cancers and diabetes, they manage their weight better, increase their tolerance for



physical work, and they improve their muscle and bone health. They are also likely to improve their psychological well-being and life quality. Not only does physical activity have the potential to add years to life, but the evidence is also accumulating that it can add life to years.

For many years, exercise and health promoters adopted training guidelines for the improvement of cardiovascular fitness. This involved quite vigorous exercise using large muscle groups in continuous work for a minimum of 20 minutes at an intensity equivalent to 60-80% of maximum heart rate. Unfortunately, after almost two decades of promoting this message in the USA, there has been little increase in the percentage of the population (20%) exercising at this level. It seems that it is too demanding for most people. The evidence also indicates that it is not essential to work so hard in order to appreciate health gains. There is a curve of diminishing returns regarding physical activity level and health benefit (see Figure 2) with the greatest gains to be made by individuals changing from the sedentary to moderately active category (Haskell, 1994).

FIGURE 2: The benefits of changing sedentary people to exercising people has the greatest potential for public health benefit.



Adapted from Pate, R.R. et al., (1995). *Physical activity and public health: A recommendation from the Centre of Disease Control and Prevention and the American College of Sports Medicine. Journal of the American Medical Association, 273, 402-8*

The dominant physical activity promotion message is now to take regular activity of a moderate intensity. Moderately intense physical activity, equivalent to brisk walking, is thought to be achievable by a much larger percentage of the population as it can be reasonably incorporated into daily routines and is less physically demanding. Current recommendations (US Department of Health and Human Services, 1996; Killoran et al., 1994) emphasise brisk walking on most or all of the days of the week for 30 minutes at a time. Evidence is gathering that the same amount taken in two or three shorter bouts can be almost as effective and may also be more manageable on a daily basis.

It should be emphasised that this is essentially a general recommendation. Different types and intensities of activity will improve different elements of health and fitness. For example, a gentle stroll at lunchtime, although not sufficiently intensive to create an improvement in circulatory fitness, may provide a healthy break from work, enhance mood and reduce stress, while also contributing to weight management. The accumulation of small but regular periods of movement during work or leisure can also make a significant difference to energy balance and weight control in the long term. Simply standing for one hour instead of sitting watching TV each day, for example, will expend the equivalent of 1 - 2 kgs of fat per year. A daily 20-minute brisk walk will make a difference of 5 kgs per year, and for most people there will be improvements in cardiovascular fitness and potential for other physical and mental health benefits.

There may also be a benefit in reducing the amount of time spent in sedentary pursuits such as watching television. To provide maximum benefits for all areas of the body, a range of specific strengthening and stretching exercises will also be needed. This is particularly important for older people.

Furthermore, the moderate message does not overrule the extra benefits, particularly in terms of cardiovascular health and glucose metabolism, provided by more vigorous activity. However, people will need to build up to those levels over a period of many months. The broad recommendations from the Quebec Consensus Statement on Physical Activity, Health and Well-Being (Blair & Hardman, 1995) provide useful broad-based physical activity guidelines.

The promotion of physical activity will require a concerted effort from several agencies to a) help individuals reduce their sedentary time and increase their physical activity and b) change the environment to encourage more activity. National, regional and local governments will have to work with transport and building planners, schools, work places, and health authorities to encourage more walking, cycling, sport and active leisure.

Summary of recommendations from the Quebec Consensus Statement on Physical Activity, Health and Well-Being (1995)

Activities should:

- Involve large muscle groups
- Impose more than a customary load
- Require a minimum total of 700 kcal/week

- Be performed regularly and if possible daily

In practice, sustained rhythmic exercise, such as brisk walking for 20-30 minutes would fulfil this requirement in most adults.

For further maximum health benefits, activities should:

- Include some periods of vigorous activity
- Include a variety of activities
- Exercise most of the body's muscles, including trunk and upper body
- Expend up to 2000 kcals/week
- Be maintained throughout life

SUMMARY

Sedentary living is at epidemic status in Europe. The evidence linking inactive living with a range of physical and mental diseases and disorders is now accepted by leading authorities world wide. At the moment, the situation seems to be worsening rather than improving. Costs in terms of human suffering, lost productivity and health care are high.

On the surface the solution appears to be simple. People need to move more and move more often. Unfortunately, the majority of the population, particularly those most likely to benefit, such as the middle aged and elderly, are unlikely to become more active without substantial intervention. Development of European-wide policy is required, supported by national governments. These should be implemented by national and local policy and campaigns to improve public awareness of the need for active living, accompanied by schemes to make physical activity easier and more rewarding for the public. At the same time, individuals should take personal responsibility and step back and reappraise their priorities with a view to establishing lifestyles that involve healthier eating and more daily physical activity.

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