

Sport and Exercise and the Prevention and Treatment of Disease

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Introduction

Regular exercise is beneficial to health. As well as creating a feeling of healthy self awareness and improved life style a reduction in harmful habits like smoking or drinking excessive amounts of alcohol can be expected in those who exercise. Such habit changes alone would prevent premature death in many. However, there is now more positive evidence that exercise has a direct influence in maintaining health in all age groups. By comparing bus conductors with bus drivers, and postmen with sorting office staff, the epidemiologist Jerry Morris showed that exercise prevents heart attacks and his perspicacity set standards for the concept of the exercise habit.^{1,2}

Physical inactivity at any age reduces the individual's capacity for physical exertion. Those who are chronically inactive tolerate exercise badly and become increasingly more easily fatigued. Aside from physical incapacity people who have periods of prolonged inactivity develop physiological changes, the skeletal muscles become weaker and there is reduced bone density. When such people do undertake physical activity their anaerobic capacity is extremely limited and their energy stores are exhausted within minutes. This incapacity increases with age but can be reversed by regular aerobic activity. At any age physical activity has dramatic effects on body function. These result in an increased cardiac stroke volume and a slowing of the pulse rate. This is called the training effect. The vascular bed and the mitochondrial enzyme content of muscle both increase. Such trained muscles are more bio-mechanically efficient and can utilise more lipids and less glycogen (glycogen sparing effect). This is a possible reason for the reduction in low density lipoproteins (LDL) associated with exercise. The muscle adapts by increased strength and size and by being able to extract more oxygen from the blood – changes which reduce fatigue and discomfort because less lactic acid is generated. These effects can be demonstrated after eight to ten weeks of regular rhythmic exercise such as brisk walking, cycling, running or swimming.

Exercise in the Assessment of Disease

In clinical practice exercise tolerance is a valuable standard by which the effects of therapeutic agents and physical rehabilitation can be assessed. It is frequently used to assess the response to therapy and post exertional bronchoconstriction. An accurate prediction of the presence and extent of coronary artery disease in patients with angina pectoris has also been demonstrated.

Post exertional hypertension is also an important physical sign in patients on adrenergic neurone blocking drugs and careful measurement of blood pressure before and after exercise is of value in assessing patients with suspected hypovolaemia or neurodepressant drug effects. In lower limb ischemia, exercise

testing may be used as part of the standard investigation of peripheral vascular disease. In elderly patients, and those recovering from stroke or rheumatic disease, even the ability to lift a kettle or cup and to perform simple tasks may be the yardstick (all else being equal) between social independence and long term care. Improved motor ability albeit limited also indicates a successful response to rehabilitation therapy.³⁻⁵

Cardiovascular Disease

Prevention

Exercise has a positive role in the prevention of cardiovascular disease. Changes in blood lipids, especially an increase in HDL cholesterol from the endothelial surfaces of blood vessels and the exercise associated reduction in arterial blood pressure, may prevent the development of atheroma. Furthermore, glucose tolerance is improved and fibrinolysis increased, both of which contribute to the prevention of peripheral vascular disease. Recently the American College of Sports Medicine Centre for Disease Control and Prevention recommended that women should aim to walk two miles in less than 30 minutes at least three days a week and men to walk two miles in less than 27 minutes at least three days a week. These recommendations represent a change of philosophy in that it promotes moderate activity rather than strenuous activity on the basis that the health and fitness benefits are similar but they can be more easily incorporated into an individual's lifestyle.

Exercise and hypertension

Regular exercise has been observed to produce a fall in blood pressure in those who are mildly hypertensive.⁶ During exercise the blood pressure rose slightly (175 mmHg systolic) but dropped by approximately 25% afterwards and the fall was maintained for up to ten hours. These results imply that a good walk twice a day might be a reasonable treatment for mild hypertension.

Exercise and coronary heart disease

Since Morris et al (1953)⁷ published their work on London transport workers many others have reached similar conclusions relating to vigorous exercise. However, the confirmed benefits are unfortunately short-lived. Fitness in youth and young adulthood does not protect against coronary heart disease in later life. In fact, American College athletes who stopped exercising after graduation were at greater risk from coronary heart disease than their non trained colleagues.⁸ It has also been suggested that a minimum amount of physical activity may be required to produce a protective effect: an energy expenditure of around 2,000 kilocalories per week, equivalent to about five hours brisk walking or three and a half hours jogging. The findings imply that if exercise is to maintain its beneficial level it must become habitual.

Post infarction rehabilitation

Most patients who suffer an uncomplicated myocardial infarction are discharged from hospital within a few days and are encouraged to mobilise early as they also benefit from a post-infarction exercise programme. Exercise has a significant place in preventing reinfarction and accelerating the return to work.

Exercise and Peripheral Vascular Disease

Peripheral vascular disease is the most common occasion for lower limb amputation in Britain. In 1977 the report from the Royal College of Physicians, Smoking and Health, stated that over 95% of patients with arterial disease of the legs were smokers and that those who continued to smoke were much more likely to develop gangrene of the leg and suffer subsequent amputation than those who stopped. The mechanism by which the improvement is achieved is uncertain but the long term results are good. The most striking change is the increase in oxidative enzymes in the trained muscle similar to that seen in physically trained normal individuals as an adaptation to hypoxia.⁹

Exercise and Metabolic Disease

Diabetes Mellitus

Physical training increases insulin sensitivity and has been shown to have a beneficial effect on the control of blood glucose in maturity onset diabetics. In juvenile onset diabetes the effect of exercise is less clear but anecdotal observations imply that less insulin may be required to maintain control.¹⁰

Obesity

“Obesity is the biggest health problem we face this century. It is almost certainly going to reverse the rise in life expectancy. It will increase the risks of a number of cancers. Hip and knee surgery requirement is going to be vast and it is now pictured to overtake alcohol as the biggest cause of liver cirrhosis within two decades”. Professor Christopher Hawkey’s comments came as a new poll showed that more than five out of six people are unaware disease is linked to excessive weight.¹¹⁻¹³

Body weight reduction is best effected by a combination of diet and exercise and observations have been made in obese adult females when they took brisk walking five days a week for up to 50 minutes per day and also in obese adolescents who undertook a regime of dietary restriction and bicycle riding. In all cases greater weight loss was achieved than in the control groups.¹¹⁻¹³

Exercise in the Prevention and Management of Osteoporosis

It has been demonstrated that weightlifters, cross country runners and ballet dancers all have a higher than average bone mass. With aging, particularly in women, the risk of osteoporosis and fracture, especially of the femoral neck, is increased. Regular exercise will increase the bone mineral content (BMC) in both men and women and there is a strong case for both pre and post menopausal women undertaking regular exercise which should ideally be anti-gravitational to prevent osteoporosis.¹³

Exercise in the management of Obstructive Airway Disease

In both asthmatic and bronchitic patients exercise regimes have also been shown to improve performance due to a combination of increased tolerance to physical activity and improved lung function.¹⁴

Exercise after school

Many people stop taking part in regular exercise after they leave school, university, college or the Forces. At these institutions the exercise is organised and often compulsory. Other factors such as beginning to earn a living, getting married, or the arrival of a new baby take up time and lead to a decrease in organised exercise. As age progresses the habit persists. In elderly people Society accepts stiffness, weakness and slowness as part of the aging process. We tend to allow our elders to lose their independence by discouraging their physical activity. It may be quicker for us to do their shopping than to do it together. The elderly are not only old but generally tend to be very unfit. Decrease in exercise as age progresses, or after major life events, leads to the concept of the fitness gap. All four aspects of fitness – strengths, stamina, suppleness and skill – can be improved at any age. These are coupled with psychological benefits, increased physical performance and a better quality of life.¹⁴

Exercise and psychological wellbeing

People who regularly exercise appear to suffer from less depression or tension than those who do not. In fact mildly anxious or depressed people may note a marked change in mood after an exercise regime which is now increasingly being incorporated into psychotherapy.¹⁵ The effect seems to be mediated through beta endorphin activity, some or all of which may contribute to the phenomenon of a “Runner’s High”.

Table 1 – Impact of Exercise on Health (McLatchie 1990)¹⁸

- Control of mild hypertension
- Reduction of body mass due to appetite suppression – healthy dietary practice
- Alteration in lipid profile
- Favourable effects on pregnancy
- Prevention and alleviation of low back pain
- Reduction in cigarette smoking
- Reduction in alcohol consumption
- Reduction in anxiety; elevation in mood
- Improved self image; reduction in anti social behaviour
- Reduction of promiscuous behaviour
- Improved corporate image
- Improved work attendance and production

References

- Morris J. Exercise Health and Medicine. *British Medical Journal* 1983; 286: 1597-8.
- Jeremy Morris Epidemiologist, who showed the health benefits of exercise *BMJ* 2009; 339:84679 – not referenced.
- Elamin MS, Boyle R, Kardash MM, et al. Accurate detection of coronary heart disease by new exercise test. *British Heart Journal* 1982; 48: 311-320.
- Hoffbrand, BI. Post Exertional Hypertension: A valuable physical sign. *British Medical Journal* 1982; 285: 1242.
- Wilcox RG, Bennett T, Brown AM, McDonald LA. Is exercise good for high blood pressure? *British Medical Journal* 1982; 285: 767-76.
- Morris JN, Heady JA, Raffle PAB, Roberts CJ, Parks JW. Coronary heart disease and physical activity of work. *Lancet* 1953; ii: 1053-1057.
- Paffenburger RS Jr, and Hyde RT. Epidemiology of exercise and coronary heart disease (exercise, health, medicine) abstracts, 1983.
- Paffenburger RS Jr, Hyde RT, Wing AL, and Hirsch CC. Physical activity: all causes of mortality and longevity of college alumni. *New England Journal of Medicine* 1986; 314: 605-613.
- Lundgren F, Fahllof AG, Lundholm K, Schersten T and Volkmann R. Intermittent claudication, surgical reconstruction or physical training – a prospective randomised trial of treatment efficiency. *Annals of Surgery* 1989; 209: 346-395.
- Chisholm DJ. Diabetes Mellitus, in J Blumfield, PA Fricker and KD Fitch (Eds). *Textbook of Science and Medicine in Sport*, Oxford: Blackwell Scientific, 1992: 555-561.
- Hawkey C. "Obesity will cause more liver damage than alcohol". President of the British Society of Gastroenterology Public Statement 1.11.2009.
- Hill JO, Schlundt DJ, Strocchio T et al. Evaluation of an alternating calories diet with and without exercise in the treatment of obesity. *American Journal of Clinical Nutrition* 1989; 50: 248-254.
- Stephanick ML. Exercise and weight control. *Exercise and Sports Science Review* 1993; 21: 363-396.
- Stephenson JC, Lees B, Davenport M et al. Determinance of Bone Density in Normal Women: Risk factors for future osteoporosis. *British Medical Journal* 1989; 298: 924-928.
- Gray JAM. The Fitness Gap. *British Medical Journal* 1982; 285: 545-547.
- Ries AL, Moser, KM. Comparison of isocapnic hyperventilation and walking, exercise training at home and pulmonary rehabilitation. *Chess* 1986; 90: 285-289.
- Martinson, AW. Physical fitness, anxiety and depression. *British Journal of Hospital Medicine*, 1990; 43: 194-199.
- McLatchie, GR. A team approach central to management, in soft tissue injury – a team approach. *Medical Action Communications*, 1990.

Book Review

Understanding Suicide; Why We Don't and How We Might

James R Rogers and David Lester

Hogrefe Publishing, 2010

The first part of this book examines the contribution that each of the major disciplines, psychiatry, psychology, sociology and anthropology, has made to the research and understanding of suicide over the last hundred years, providing an overview of known theories and commenting on the methodology used in each case. From this, the authors have formulated recommendations as to what future research topics would help progress thinking around suicide and its causes.

In the second part, Rogers and Lester look at existing work based on eight illustrative topics: attitudes towards suicide, sexual abuse, risk assessment, fads (including sex difference studies), social relationships, personal narratives, suicidal personality and typologies. They continue the theme of making specific recommendations, encouraging the challenging of accepted hypotheses and offering further direction for new research.

Some may find this book provocative but the authors write with authority on the subject and do not spare themselves the critical eye. As they say in their conclusions, criticism of theory and research is easy but it is also very difficult to get out of the ruts that previous theorists and researchers have dug. Much of the current drive for the prevention of suicide is underpinned by not presuming anything about what types of people may be suicidal. This book suggests that there are many unexplored avenues and is, therefore, a useful addition to the library of anyone seeking to meaningfully add to the exploration of this vast, and often misunderstood, topic.

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