



Cycle Fit

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Introduction

Despite gaps the size of the Grand Canyon, Britain now has a cycleway network, but not because somebody in the ministry suddenly saw the light. It was achieved by cycling advocates battering down doors to talk the talk with Whitehall and city hall, planners and providers. They spoke the same language, knew their subject and won concessions.

As many predicted, providing cycling facilities alone has not been the panacea to our urban traffic problems, and the number of bums on bikes continues to drop. While the battle for appropriate infrastructure is unrelenting, a new front has opened up - one with the potential to achieve everything planners and highway engineers were never going to. After a decade of being told by the British Medical Association that cycling is good for mind and body, the health authorities have finally taken note.

Around the country all manner of interesting initiatives are being funded by health, from cycling on prescription, to adult cycle training classes, to something like Think Cycling in Cambridge, exploring how best to market pedal pushing. Though in their infancy, these projects are specifically geared to encouraging the public to pedal their way back to health and fitness with the object of trimming a small fortune on the NHS budget.

But when cycling initiatives are bidding for funding from the same pot that consultants are lobbying for new dialysis machines and scanners, it is not sufficient to simply argue that cycling is exercise and exercise is good news. We need to know our stuff and talk the talk. So it was that the Nottingham Health Authority commissioned me to trawl through the research and produce a plain English report outlining the facts.

There is actually precious little research specifically about cycling, and much has had to be extrapolated from papers studying exercise. For example, a major survey in the U.S. involving 13,000 people recorded a substantial difference between the fit and the unfit, concluding that: 'higher levels of physical fitness appear to delay all-cause mortality, primarily due to lowered rates of cardiovascular disease and cancer'. Exercise in moderation undoubtedly contributes considerably to reducing the risk of premature death.

Of all the forms of exercise available to the public, swimming, cycling and brisk walking we're proven to offer the greatest benefit for the least expense, inconvenience and risk of injury. Of those, cycling came out on top because it is also a means of transport and could be incorporated into a working day. Thus a study among factory workers discovered that regular cyclists enjoy a level of fitness equivalent to that of individuals ten years younger.

Another piece of research found that cycling 60 miles a week from the age of 35 could add two years to your life expectancy, and a Dutch study concluded that everyday or utility cycling yields much the same improvements in physical performance as specific training programmes. For those with a low initial fitness level, a single trip distance of three kilometres a day was found to be sufficient to greatly improve physical performance and general health.

Why is exercise beneficial?

The human body is designed for movement. To develop and maintain peak levels of fitness, exercise must be carried out on a regular basis and must be relatively strenuous. The recommended amount from a health perspective is about twenty to thirty minutes of moderate exercise three times a week, though the level of activity which produces a benefit is a factor of the individual's initial level of fitness.

The energy which is needed for exercise comes from two major series of chemical reactions - anaerobic and aerobic. Of the two, aerobic exercise is of primary importance in producing health benefits. During aerobic exercise, oxygen is gradually released to the muscles, fuelling efficient, energy-yielding reactions. Thus aerobic exercise can be sustained over a much longer period than anaerobic exercise, with the following beneficial effects...

Muscle-strength

Muscle-endurance and strength develop from early childhood, but recent studies indicate that exercise will result in gains in muscle-strength even in extreme old age. To facilitate an independent lifestyle it is necessary to maintain an adequate level of muscle-strength, particularly in the major muscles associated with the movement of limbs.

The variety of muscles exercised while pedalling is limited by comparison with many forms of exercise, but cycling has built-in rest periods between its submaximal rhythms which reduce anaerobic elements, fatigue and the accumulation of lactic-acid. The rhythmic contraction and relaxation of the large limb muscles can therefore be sustained over long periods without fear of injury, particularly as the body is supported on a saddle.

Asthma and bronchitis

Adequate respiratory function is essential for good health. It is a composite of the purely mechanical process of breathing and the ability of the heart and the blood to transport oxygen to the tissues and carbon dioxide back to the lungs. Vigorous exercise increases deep breathing, during which the lungs take in more oxygen and dispel more carbon dioxide than when our bodies are at rest. Regular exercise therefore hones the breathing muscles, improving the long-term delivery of oxygen to muscles and tissue.

Vigorous cycling is an excellent way of stimulating deep breathing. It is particularly beneficial for patients with chronic conditions such as asthma and bronchitis. While asthmatics need to be careful, there is evidence that moderate exercise extends their capacity for exertion. There are also many cases of patients with long-standing bronchial problems taking up cycling and making a full recovery.

Diabetes

Diabetes exerts a huge toll on individuals. Several treatments are effective in preventing the devastating complications of diabetes, but these are suboptimally used, and the disease itself is chronic, progressive and degenerative. Recent research, however, has found that diabetes may be prevented by lifestyle changes.

A study of 522 middle aged, overweight people with impaired glucose tolerance showed that a lifestyle change which includes regular exercise can reduce the risk of progression to diabetes by a striking 58% over four years. Regular cycling can reverse the proximal factors associated with diabetes such as obesity, physical inactivity, high fat and energy diets, high blood pressure and lipids (see below).

Mental Health

Because it is so subjective, this is a grey area, but evidence has been found linking exercise with endorphins - substances with a calming effect produced by the brain. Stimulating the body helps release endorphins which can lift depression and relieve mental stress much like a psychoactive drug. Aerobic exercise also helps to reduce mental stress in general, in the sense that it raises tolerance to stress.

One study concluded that psychological improvements often occur independent of fitness changes, possibly from factors such as the sense of achievement and positive feelings of self-control, or simply from social interaction while taking the exercise.

And hard cycling has been found to reduce tension. In a study performed on exercise bikes, a group pedalling for twenty minutes at 75-to-80% intensity were found to have muscles twice as relaxed as a group exercising at 40% intensity. This decreased muscle tension is thought to result in a greater degree of relaxation and reduced stress.

Anecdotally, many people affirm they 'feel good' during or for some time after exercise. While subjective responses prove nothing to the scientists, cycling appears to contribute to mental well-being simply because of the positive enjoyment that people gain from it. It confers a feeling of freedom and independence, and a sense of achievement derived from satisfying journey-needs entirely through one's own efforts.

Cardovascular disease

Diseases of the heart and circulation, together with cancer, are the commonest causes of death in Britain. Coronary heart disease accounts for about 80% of heart diseases and is the greatest single cause of death, responsible for a third of all deaths in men and a quarter in women. The treatment of heart related conditions cost the NHS over £500 million in 1988 and it's only gone up. Added to this are the costs to industry associated with time off work (estimated at £1.8 billion) and the unquantifiable costs of personal and family anxiety, limitation of activity, and so forth.

The heart pumps blood round the system, taking oxygen to various parts of the body. The ease with which the heart can carry out this task determines the amount of strain it experiences. During vigorous exercise, blood flow can increase from 5 litres to 25 litres a minute. This increase enables more oxygen to be delivered to tissues, with most of it going to the exercising muscles.

The factors most commonly understood to be associated with coronary heart disease are:

High Cholesterol Levels

Cholesterol can be broadly divided into the good type or HDL (high-density lipoprotein), and the bad type or LDL (low-density lipoprotein). The higher the ratio of HDL to LDL, the more likely the heart and its coronary arteries are to be healthy. If the ratio is low, the walls of the arteries fur up (atherosclerosis) with deposits of cholesterol, resulting in a reduced flow of blood. High levels of HDL cholesterol can help to remove some of the cholesterol from artery walls and transport it to the liver where it is metabolised.

Many studies have shown that exercise leads to changes in the proportions of high and low-density lipoproteins. The level of LDL decreases and the level of HDL increases in response to training, which should reduce the incidence of both atherosclerosis and coronary thrombosis.

High Blood Pressure

Insurance statistics show that men with only moderately high blood pressure (hypertension) can expect to die about fifteen years before men with low blood pressure. Blood always needs to be under pressure to circulate, but if the pressure rises too high the heart has to work harder, again increasing the risk of coronary problems. Regular exercise can lead to a fall in blood pressure when this is already higher than normal, and is potentially a major non-pharmacological method of lowering blood pressure.

Stress

Stress is difficult to define, though we know that a certain amount is required for healthy functioning. Studies have been unable to show precisely what role it plays in heart disease, but stress produces adrenaline, which stimulates the heart to beat faster. Under too much stress blood pressure rises, the rate of blood coagulation increases and the liver releases sugar and fats into the bloodstream to provide energy. An increase in the blood coagulation rate increases the chances of blood-clots, and the excess fat in the blood can be deposited in the arteries.

Cardovascular disease

Until recently, people with heart conditions were told to rest as a cure. However, the role of physical activity and inactivity in causing and treating coronary heart disease has increasingly come to the fore. Research over the years has confirmed the major preventive role that daily exercise can play. Men whose work or leisure activities involve vigorous exercise are less likely than their non-exercising contemporaries to develop or die of coronary heart disease. Several studies have suggested that only rather low levels of activity are necessary to confer some degree of protection against heart disease, both in terms of the intensity of effort and of the total amount of exercise taken.

Obesity

According to insurance statistics, 7 per cent of the adult population in this country are seriously obese (i.e. more than 30 per cent above a desirable height/weight ratio), and a government survey finds that one in three adults are overweight. Obesity is associated with an increased risk of heart disease, hypertension, late-onset diabetes, arthritis and bronchitis. Though there has been some controversy about the value of exercise in weight reduction, a brisk walk of about thirty miles will burn off a pound of fat.

About four to five calories a minute are expended when cycling gently, three to four times higher than when a person is sitting at rest. Cycling for half an hour a day uses 120 to 150 calories (i.e. on a routine five-day-a-week basis, up to 750 calories, and over a year, up to 40,000 calories). The energy value of one kilogram of adipose (fatty) tissue is about 7,700 calories. Cycling for half an hour a day therefore expends an annual amount of energy equivalent to that stored in over five kilograms of adipose tissue.

Exercise also stimulates the metabolic rate, enabling the body to extract a higher intake of vitamins, minerals and trace elements from any given quantity of food. Strenuous exercise may also help to maintain the metabolic rate for as long as twenty-four hours after the exercise itself.

Direct evidence relating cycling to reduced rates of coronary heart disease is sparse, but several related studies can be mentioned. A short paper specifically about cyclists published in the British Medical Journal showed that there was a decrease in the incidence of myocardial infarction (pertaining to the muscles of the heart) and ischaemic heart disease (pertaining to deficiencies in blood supply) in all the cyclists studied, and a tenfold decrease in the incidence of ischaemic heart disease in the over-75 group.

Another study took a group of patients with heart problems and tested the effects on their heart of pedalling an exercise bike. It concluded that 'home-based physical training programmes are feasible even in severe chronic heart failure and have a beneficial effect on exercise tolerance, peak oxygen consumption, and symptoms. The commonly held belief that rest is the mainstay of treatment of chronic heart failure should no longer be accepted.'

Conclusion

The major theme that emerges from the evidence is that, for exercise to be beneficial, it has to be regular and maintained throughout life. To improve or maintain fitness there is a threshold intensity level which must be exceeded and this level is dependent on the initial fitness level. It follows that the kind of exercise which is ideal is one that can be entered at any level, is conveniently undertaken on a day-to-day basis, requires no facilities, is inexpensive, and is of minimum inconvenience to our daily routine. For the majority of the population, walking and cycling meet these criteria better than any other activity.

With 72% of all car journeys clocking under five miles, there is the potential for a substantial modal shift away from motorised transport towards cycling. Aside from boosting the health of the nation, a move away would significantly reduce air and noise pollution, greatly relieve urban congestion and the associated stress, and massively improve our living and working environments.

But there is concern in the medical profession that encouraging cycling will lead to an increase in casualties and fatalities on the road. This has not been the case in countries where vulnerable road users are properly catered for. For example, by distance travelled, cycling in the Netherlands is five times safer than cycling in Britain. In Denmark it is 12 times safer, and in both countries cyclists constitute a far greater portion of the modal breakdown than in Britain.

Away from cycling facilities, the evidence indicates that the more cyclists there are on the road, the safer cycling in traffic becomes. In York, the policy of prioritising healthy modes of transport and restraining motor traffic has led to casualty reductions well above the national average. The city has one of the largest pedestrian and cyclist specific networks in Europe, with over 13% of city staff walking to work and 22% of work related trips being made by bicycle.

York is exceptional, but even without proper cycling facilities, it seems concern over the wisdom of encouraging more people into seemingly hostile traffic is unfounded. The same European report contained an estimate of the number of years of life lost through cycling accidents compared to the number of years gained through improved health and fitness due to regular cycling. It concluded that even in the current environment, the benefits gained were likely to outweigh the loss of life by a ratio of around 20:1.

In the next ten years, GPs will be prescribing cycling and there will be adult cycle training schemes, available through every regional health authority, equipping patients with the confidence to ride away on their own. It already happens in America. But if the authorities are really going to grasp the nettle and put their money where the research is they have to be convinced that motor dependency is bad news for more than just their parking problem.

To coax people away from their cars requires a radical alteration of behaviour on a par with that undertaken by people fighting their drink, drug or eating problems. And undoubtedly the best example of a success story is the 'smoking cessation' campaign of the last fifteen years generated by none other than the health authorities. They've done it once and cycling advocates are arguing they can do it again.