

A photograph of a golfer in a dark blue polo shirt, white shorts, and a white visor, captured in the middle of a putting stroke on a lush green golf course. The golfer is positioned on the right side of the frame, leaning forward with their club on the green. The background shows a well-maintained golf course with rolling hills and trees under a bright sky.

Exercise five times a week

The Government is encouraging people to participate in physical activity at least five times a week, following the publication of a report entitled: At least five a week: Evidence on the impact of physical activity and its relationship to health

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This report sets out the available evidence from around the world for the impact that physical activity has on public health. The evidence clearly demonstrates that an inactive lifestyle has a substantial, negative impact on both individual and public health – specifically, that physical inactivity is a primary contributor to a broad range of chronic diseases, such as coronary heart disease, stroke, diabetes and some cancers. The high level of individual suffering caused by these diseases, together with the substantial associated financial costs, make this a major public health issue.

Smoking cigarettes and an unhealthy diet have long been established as major causal factors for chronic disease. This report establishes that physical inactivity is equally important. The report describes the high preventive and therapeutic potential of physical activity to reduce the burden of chronic disease. These effects are demonstrated in people at all stages of life, and in people of both sexes and of differing socio-economic circumstances. This report endorses the advice for healthy levels of activity, but also suggests – where evidence allows – more specific recommendations for prevention and treatment of individual diseases and conditions.

The report does not address evidence relating to how activity patterns can be changed. This report is based on a comprehensive review of the evidence, carried out by a distinguished team of academics and expert advisors. It brings together a large and diverse literature from the fields of epidemiology, exercise physiology, medicine, psychology and health economics. The report has been scrutinised by an advisory group, and by expert reviewers from the UK and around the world.

The public health importance of physical activity

Disease and disability caused by physical inactivity cause serious and unnecessary human suffering and impaired quality of life. The estimated costs of physical inactivity in England are £8.2 billion annually, which does not include the contribution of inactivity to obesity, which in itself has been estimated at £2.5 billion annually. These figures include both the costs to the NHS and costs related to the economy, such as absence from work. It is not possible to estimate the number of deaths attributable to inactivity, as this is not a documented cause of death. However, the public health importance of physical activity is clear, as adults who are physically active have 20 to 30 per cent reduced risk of premature death, and up to 50 per cent reduced risk of developing the major chronic diseases such as coronary heart disease, stroke, diabetes and cancers.

However, physical activity levels in England are low in virtually all sections of the adult population, and there are increasing concerns regarding some groups of children, such as teenage girls. Up to two thirds of men and three quarters of women report activity levels that



Physical activity, such as cycling, is encouraged at least five times a week.

substantially increase their risk of contracting a broad range of – possibly up to 20 – chronic diseases.

Overall, it appears that, over the past 20 or 30 years, there has been a decrease in physical activity as part of daily routines in England, but a small increase in the proportion of people taking physical activity for leisure. The overall reduction in population activity levels partly reflects other changes that have taken place in society. For example, compared with 30 to 40 years ago there are fewer manual jobs, and the physically active elements of housework, shopping and other necessary activities have diminished substantially in western society. In England, people undertake less regular travel on foot or by bicycle than in the past: over the past 25 years, both walking (which is the most common form of physical activity) and cycling have declined by 26 per cent.

Children are more active than adults, although it is unclear whether they participate in sufficient activity to achieve the full range of health benefits. About a third of boys and a third to a half of girls report activity levels that may compromise their health. Reductions in activity levels among children, during the course of normal daily living, are likely to have reduced the amount of energy expended and to have contributed to the epidemic of obesity referred to in the Annual Report of the Chief Medical Officer for 2002.

In adults, both physical activity and cardiorespiratory fitness are strongly related to health. In children, the health benefits of physical activity are widely accepted, whereas the role of fitness is suggestive but as yet unconfirmed.

That physical activity should provide such a wide range of benefits, might suggest that other underlying factors – such as socioeconomic disadvantage, for example – are at play. However, physical activity is such a fundamental human behaviour that it is capable of influencing most major body systems. Where it has been feasible to conduct controlled experiments of physical activity, changes in health status have resulted that provide evidence against alternative interpretations of associations between physical activity and health.

Appropriate levels of physical activity

Since 1996, the Department of Health's advice for physical activity has been that adults should aim to take 30 minutes of at least moderate activity on at least five days a week. For children and young people, the advice has been for one hour of moderate-intensity physical activity each day and this can be continuous activity or intermittent throughout the day. This advice on physical activity, and other very similar recommendations from around the world, have been established by various bodies through rigorous processes of review and discussion. They are generally accepted worldwide.

This report confirms that, according to the best evidence, these recommendations remain appropriate for general health benefit across a wide range of diseases. The report goes further, however, and suggests that different modes and patterns of activity can be equally effective, and it describes more detailed and specific activity recommendations for individual diseases (see panel: *Recommendations for active living throughout the lifecourse*).

For most people, the easiest and most acceptable forms of physical activity are those that can be incorporated into everyday life. Examples include walking or cycling instead of driving, and taking up active hobbies and leisure pursuits, such as gardening and social sporting activities. Individual patterns of active living should both improve physical health and promote long-term adherence to activity.

Occupational physical activity can also be an important source of activity, although this is less under the control of the individual. Nevertheless, individuals can endeavour to build more activity into their working hours, for example by creative use of free time and habitual use of stairs.

The risks associated with the recommended levels of activity are low for people of all ages. A larger quantity of activity at higher intensity can bring further benefits, and this might be an ultimate aspiration for some people. However, very high levels of fitness training or engagement in vigorous and contact sports both carry higher

risk of sports/exercise-related injury. Similarly, progression from one level of activity to another that is too rapid carries a higher risk.

Effects across the lifecourse

Evidence of a health benefit for physical activity is seen throughout the lifecourse. In children, effects are predominantly seen in amelioration of risk factors for disease, avoidance of weight gain, achieving a high-peak bone mass, and mental wellbeing. In adults, protection is conferred against the diseases themselves – including cardiovascular disease, cancer, type 2 diabetes – and obesity.

Physical activity also promotes musculoskeletal health, mental health and well-being. The health benefits are even more pronounced in older adults and are particularly important because the diseases involved – most notably osteoporosis, circulatory diseases and depression – affect an older person's ability to maintain an independent lifestyle. In older people, activities that promote strength, coordination and balance are particularly valuable for maintaining capacity to perform common activities of daily living and, in particular, for reducing the risk of falling and of being seriously injured. Activities that promote endurance are important for all ages. The levels of activity recommended for health benefit in adults are also appropriate for older adults, with the provision that the absolute intensity of activities must necessarily be lower, in order to accommodate reduced cardiorespiratory and muscle function consequent to the ageing process.

Specific effects

The importance of physical activity with respect to the major chronic diseases is summarised below. Where appropriate, disease-specific activity recommendations – modifications to the more general activity recommendations given above – are stated.

Cardiovascular disease

Physical inactivity and low fitness are major independent risk factors for coronary heart disease in both men and women, at a level similar to that of smoking cigarettes. Inactive and unfit people have almost double the risk of dying from coronary heart disease compared with more active and fit people.

Physical activity also has beneficial effects on preventing stroke and treating peripheral vascular disease, and on modifying the classical cardiovascular risk factors such as high blood pressure and adverse lipid profiles.

Physical activity does not need to be vigorous to confer protection from cardiovascular disease: 30 minutes of moderate intensity physical activity a day on at least five days a week is sufficient to achieve benefit. Greater benefits can be obtained from a larger volume of activity, but with a 'law of diminishing returns': at higher levels of activity or fitness, smaller declines in risk are observed. Longer sessions of aerobic physical activity do not appear to have a different effect on cardiovascular



Using stairs, rather than lifts, will have benefits.

risk compared with shorter sessions, as long as the total energy expended is equivalent. There is growing support for the benefits of accumulating activity in shorter bouts of activity of 10 minutes or more, interspersed throughout the day. Such shorter bouts have demonstrated positive effects similar to a single long bout of activity of an equivalent total volume of activity, and may help people to become more active in the long term. This is critical, as the strong protective effect of activity is transient – that is, individuals only gain benefit during the periods of life when they lead a physically active lifestyle. Most benefits are lost if the activity is not maintained.

Exercise-based cardiac rehabilitation programmes for patients with coronary heart disease are generally effective in reducing the risk of premature death.

Overweight and obesity

Low levels of physical activity in England are a significant factor in the dramatic increase in prevalence of obesity. Maintaining activity

throughout life is important in avoiding weight gain. Physical activity by itself can result in modest weight loss of around 0.5kg to 1kg per month but the most effective way to lose weight involves a combination of physical activity and diet. This will maximise fat loss, preserve lean tissue, and maximise fitness and health benefit. Only a small proportion of those following weight loss programmes maintain their weight loss in the long term. Those who achieve and maintain regular physical activity are more likely to be successful.

Physical activity also brings important reductions in risk of morbidity and mortality for those who are already overweight or obese.

Current physical activity advice for adults – of 30 minutes of at least moderate intensity activity on at least five days a week – will represent a significant increase in energy expenditure for most people and will contribute to their ongoing weight management. However, in today's sedentary society, and in the absence of a reduction in energy intake, 30 minutes' activity a day on five or more days a week may not be enough to prevent the

development of obesity for many people, and 45-60 minutes of moderate intensity activity per day may be needed. People who have been obese and have managed to lose weight may need to do 60-90 minutes' activity a day in order to avoid regaining weight. Also, activity that can be incorporated into everyday life may be as effective for weight loss as structured, supervised exercise programmes. This broadens the range of effective choices available for increasing activity among the general public.

Energy expenditure is a direct result of moving body weight and so any movement built into the daily routine will contribute to energy balance. People who need to lose weight should therefore be encouraged to walk more, take up active hobbies and reduce the amount of time they spend inactive.

Diabetes

Physical inactivity is a major risk factor for the development of type 2 diabetes, with active people

having a 33 to 50 per cent lower risk, compared with inactive people. High-risk individuals, in particular, can substantially reduce their risk of developing type 2 diabetes by becoming more active. Regular, moderate intensity physical activity is sufficient to reduce the risk of developing type 2 diabetes, although the optimum type, intensity, frequency, duration or volume of activity needed are unclear.

Regular physical activity can produce metabolic

TABLE 1 LEVEL AND STRENGTH OF EVIDENCE FOR A RELATIONSHIP BETWEEN PHYSICAL ACTIVITY AND CONTEMPORARY CHRONIC CONDITIONS

Condition	PREVENTATIVE EFFECTS			THERAPEUTIC EFFECTS	
	Level of evidence [†]	Strength of effect	Evidence of a dose response relationship	Level of evidence [†]	Strength of effect
Cardiovascular disease					
Coronary heart disease	High	Strong	Yes	Medium	Moderate
Stroke – occlusive	High	Moderate	–	Low	Weak
– haemorrhagic	Medium	Weak	–	Low	Weak
Peripheral vascular disease	No data/ insufficient data	–	–	Medium	Moderate
Obesity and overweight	Medium	Moderate§	–	Medium	Moderate§
Type 2 diabetes	High	Strong	Yes	Medium	Weak
Musculoskeletal disorders					
Osteoporosis‡	High	Strong	–	Medium	Weak
Osteoarthritis	No data/ insufficient data	–	–	Medium	Moderate
Low back pain	Medium	Weak	–	High	Moderate
Psychological well-being and mental illness					
Clinical depression	Low	Weak	–	Medium	Moderate
Other mental illness	No data/ insufficient data	–	–	Low	Weak
Mental well-being	–	–	–	Medium	Moderate
Mental function	Low	Moderate	–	Low	Weak
Social well-being	No data/ insufficient data	–	–	Low	Weak
Cancer					
Overall	Medium	Moderate	Yes	} No data/ insufficient data	–
Colon	High	Strong	Yes		
Rectal	Medium	No effect	–		
Breast	High	Moderate	Yes		
Lung	Low	Moderate	–		
Prostate	Medium	Equivocal	–		
Endometrial	Low	Weak	Yes		
Others	Low	Equivocal	–		

† = Volume and quality of data
 ‡ = From bone mineral density data. Osteoporosis is defined in terms of bone mineral density.
 § = Includes the effect of activity on disease as well as weight status.
 § = However, a low level of evidence indicates weak effects on physical function and fatigue during and following cancer treatment.

This table provides a simplified summary of the nature and volume of evidence and an estimate of the strength of effect of activity currently indicated by that evidence. The 'level of evidence' is intended to be a general indication of the volume and quality of the available evidence. The 'strength of effect' is intended to indicate how positive, or otherwise, the findings are. Three broad categories (descriptors), agreed

between the Review Panel and the Expert Reviewers, have been selected within both 'level of evidence' and 'strength of effect'. There is considerable variability in both the volume and quality of studies found in different areas of research regarding activity and health. Cardiovascular disease is relatively well investigated compared with areas such as obesity and mental health that have only

recently attracted interest. The full picture is further confounded by the fact that physical inactivity affects a wide range of diseases and risk factors, many of which may occur in the same individual. The multiple effects of increased activity across these many chronic conditions are rarely considered in study design, so the true value of physical activity in terms of public health may well be under-estimated.

benefits that contribute to management of type 2 diabetes. Also, risk of premature death is much lower in active and fit persons with type 2 diabetes than in patients who are inactive and unfit.

Musculoskeletal health

Physical activity increases bone mineral density in adolescents, maintains it in young adults, and slows its decline in old age. Physical activity can delay the progression of osteoporosis by slowing down the rate at which bone mineral density is reduced from the late 20s onwards, but it cannot reverse advanced bone loss. Physical activity may also delay the progression of osteoarthritis, although no evidence directly confirms that onset can be prevented. There are also indications that physical activity may delay the onset of low back pain.

Activities that produce high physical stresses on the bones (for example, chasing games, skipping, running, jumping, gymnastics, jogging or tennis) are necessary throughout life to provide optimal protection against osteoporosis. Such activities in adolescence increase peak bone mass, while postadolescent physical activity reduces the rate of bone loss. Bone mineral density is not increased at all by low-impact exercises such as swimming. Activities that promote strength, balance and power may be important for older people because of their potential to prevent falls.

Physical activity has beneficial effects for people with osteoarthritis, including those who have had a joint replacement, but too much physical activity can be detrimental in that it can aggravate the condition.

Aerobics-type exercise programmes can help prevent recurrence of low back pain. General leisure-time activities are also recommended for people with low back pain, but they should avoid: heavier sporting activities which involve lifting, twisting, pulling and pushing; excessive loading of the back muscles; and excessive overall levels

of physical activity. Yoga-style exercise, and exercises to increase endurance of the abdominal and back muscles, may also be helpful.

Mental illness

People who lead an active lifestyle over several years have a reduced risk of suffering symptoms of clinical depression. Physical activity is effective as a treatment of mild, moderate and severe clinical depression. It may also help people with other mental illnesses, and improve their physical and mental well-being, even if there is no change in the status of their mental illness.

Mental health

Physical activity helps people feel better through improvement in mood, reduced anxiety and enhanced self-perceptions. Physical activity can also help people to function better through alleviation of stress, and improved sleep, and – in older people – through some aspects of cognitive function.

Regular moderate intensity activity can improve psychological well-being. Evidence is strongest for activity which lasts between 20 and 60 minutes. However, shorter bouts (10-15 minutes) of moderate intensity walking can induce significant positive changes in mood. Rhythmic aerobic forms of exercise – such as brisk walking, jogging, cycling, swimming or dancing – appear to be most consistently effective. Resistance exercise may be useful for enhancing self-perceptions, as it can have rapid effects on how the body feels and functions.

Competitive sports and vigorous forms of exercise are an important source of psychological well-being for those who are already accustomed to this type of activity. Group recreational sports and activities are also likely to bring social and mood benefits. However, no generic mechanisms have been established to explain the positive effects

of activity on psychological improvement. The effects in individuals are likely to be more variable than those found with physiological or biomedical change and may depend on the individual's subjective experiences of the activity and the setting in which it takes place. A range of exercise modes and intensities, based on the participant's previous exercise experiences, preferences and goals, will therefore need to be considered.

Cancer

Physical activity is associated with a reduction in overall risk of cancer. There is a marked protective effect on colon cancer: the most active individuals have, on average, a 40 to 50 per cent lower risk than the least active. Physical activity is also associated with a reduced risk of breast cancer among postmenopausal women, and possibly also to a reduction in risk of lung cancer. Physical activity can also have an indirect effect through its role in the prevention of obesity which, in the USA, has been estimated to result in 10 per cent of all-cause cancers.

For optimal protection, activity should be maintained throughout the lifetime. The optimal intensity, frequency and duration of physical activity needed for a protective effect have not been reliably defined. Moderate to vigorous intensity physical activity performed frequently may be required for a significant protective effect.

Range of benefits

Whereas the beneficial effects seen within specific diseases are important in their own right, possibly the greatest public health contribution of physical activity is its strength of effect over such a wide range of common diseases. Table 1 gives a simplified overview of the general level of evidence and strength of effect existing across these important diseases. The table shows that, while physical activity constitutes an effective therapy for many conditions, the strongest effects are seen in prevention. Also, stronger relationships are observed where the level of evidence is highest.

The critical message is that health benefits occur across virtually the full range of diseases. This breadth of action, combined with the size of the different effects, along with the prevalence of inactivity among the public, makes physical activity one of the main contemporary public health issues.

Conclusion

The extensive evidence reviewed in this report reinforces the view that physical inactivity is undoubtedly one of the major contributory factors to the current epidemics of chronic disease. The encouragement of active lifestyles must be an important element of any future public health strategy. ●

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● see *Last Word*, page 49.

Recommendations for active living throughout the lifecourse

- Children and young people should achieve a total of at least 60 minutes of at least moderate intensity physical activity each day. At least twice a week this should include activities to improve bone health (activities that produce high physical stresses on the bones), muscle strength and flexibility;
- For general health benefit, adults should achieve a total of at least 30 minutes a day of at least moderate intensity physical activity on five or more days of the week;
- The recommended levels of activity can be achieved either by doing all the daily activity in one session, or through several shorter bouts of activity of 10 minutes or more. The activity can be lifestyle activity* or structured exercise or sport, or a combination of these;
- More specific activity recommendations for adults are made for beneficial effects for individual diseases and conditions. All movement contributes to energy expenditure and is important for weight management. It is likely that for many people, 45-60 minutes of moderate intensity physical activity a day is necessary to prevent obesity. For bone health, activities that produce high physical stresses on the bones are necessary;
- The recommendations for adults are also appropriate for older adults. Older people should take particular care to keep moving and retain their mobility through daily activity. Additionally, specific activities that promote improved strength, co-ordination and balance are particularly beneficial for older people.

* Lifestyle activity means activities that are performed as part of everyday life, such as climbing stairs or brisk walking

Further information

Full report can be downloaded from the Department of Health website: www.doh.gov.uk