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Exercise

The greater coronary heart disease morbidity of sedentary as opposed to physically active workers was demonstrated many years ago by J N Morris and his colleagues in a comparison of London bus drivers and conductors. These two groups of transport workers belonged to the same social class and had similar lifestyles. They differed principally in the amount of physical activity in which they engaged when at work. The drivers were confined to a small enclosed driving compartment which rendered them almost completely immobile, whilst the conductors were continuously active, especially as they constantly had to run up and down the stairs of the double-decker London buses. During the five-year follow-up the drivers had a CHD incidence almost double that of the conductors. The differences between the two groups became greater as their members grew older (Table IX.1).¹ The finding of this untoward accompaniment of physical inactivity has been confirmed by the results of the Framingham study² and a 27 cohort based rigorous meta-analysis reported by Jesse Berlin and Graham Colditz. These authors found a relative risk of death from coronary heart disease of 1.9 (CL 1.6-2.2) for sedentary as opposed to high physical activity groups, and the benefits were shown to be greater in the studies that the authors judged to be methodologically stronger.³ Conversely, in the Whitehall study of British civil servants leisure-time physical activity has been found to have cardiovascular health benefits similar to those apparently conferred on the London bus conductors by their workaday exertions. Vigorous weekend exercise apparently protected the middle-aged men from fatal heart attacks and non-fatal first episodes of coronary heart disease.⁴

It is probable that a randomized and controlled prospective study of the cardiovascular consequences of prolonged inactivity will never be undertaken. It would be both unethical and impractical to enforce a long-term sedentary lifestyle on a control group. However, the physiological means by which regular exercise has cardioprotective effects are now well defined. Animal studies have shown that the coronary arterial capacity becomes greater relative to the cardiac muscle mass and an increase in coronary artery diameter has been demonstrated angiographically. Capillary growth is induced and increase in coronary blood flow in response to need

¹ J N Morris *et al.*, 'Incidence and prediction of ischaemic heart-disease in London busmen', *Lancet*, 1966, ii: 553-9, p. 553.

² T R Dawber, *The Framingham study: the epidemiology of atherosclerotic disease*, Cambridge, MA, Harvard University Press, 1980, p. 161.

³ J A Berlin and G A Colditz, 'A meta-analysis of physical activity in the prevention of coronary heart disease', *Am J Epidemiol*, 1990, 132: 612-28, p. 621.

⁴ J N Morris *et al.*, 'Vigorous exercise in leisure-time and incidence of coronary heart-disease', *Lancet*, 1973, i: 333-9, p. 337.

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Table IX.1
Five-year incidence/100 of CHD in London bus crews

Age at entry	Conductors			Drivers		
	Numbers			Numbers		
	In study	CHD	Incidence	In study	CHD	Incidence
40–49	62	1	1.6	66	5	7.6
50–59	117	6	5.1	183	18	9.8
60–69	68	5	7.4	139	11	7.9
TOTAL	247	12	4.7	388	34	8.5

Source: J N Morris *et al.*, 'Incidence and prediction of heart disease in London busmen', *Lancet*, 1966, ii: 553–9, p. 553. (Permission granted by The *Lancet* Ltd.)

is enhanced.⁵ When compared to inactive controls, ligation of the left coronary artery in rats results in smaller myocardial infarcts among animals preconditioned by exercise.⁶ The beneficial consequences of human physical exertion have been summarized by Albert Oberman. By increasing energy expenditure, exercise conditioning has been shown to reduce body weight and excess fat preferentially. Physical training reduces insulin secretion while improving glucose tolerance. It improves the lipid profile by increasing levels of serum HDL and apolipoprotein A1 while reducing those of LDL cholesterol and serum triglycerides. There is an inverse correlation between intensity of physical activity and blood pressure level at rest and with submaximal exercise. The heart rate at rest and during submaximal exertion decreases with training, parasympathetic activity being increased at rest.⁷ An increase in heart muscle mass with exercise has been shown by echocardiography.⁸ Training has the potential for mitigating the undesirable left ventricular remodelling and loss of contractile function that often follows an infarct, should one occur. The benefits of exercise having been shown, the opposite and untoward cardiac consequences of an inactive life pattern can be inferred.

Occasional favourable comments on the value of physical activity were made by eighteenth-century physicians. George Cheyne for one advocated walking and horseback riding.⁹ On the whole though, the medical community made little general impression in this regard. Gymnasia for "Medicinal Exercises" were located in spas such as Bath, but the concept of exertion in order to attain physical fitness, for the

⁵ Thomas F Schaible and James Scheuer, 'Cardiac adaptations to chronic exercise', *Prog Cardiovasc Dis*, 1985, 27: 297–324, p. 310.

⁶ C L McElroy, S A Gissen and M C Fishbein, 'Exercise-induced reduction in myocardial infarct size after coronary artery occlusion in the rat', *Circulation*, 1978, 57: 958–62, p. 960.

⁷ Albert Oberman, 'Exercise and the primary prevention of cardiovascular disease', *Am J Cardiol*, 1985, 55: 10d–20d, p. 17d.

⁸ Schaible and Scheuer, *op. cit.*, note 5 above, p. 299.

⁹ Trevor H Howell, 'George Cheyne's essay on health and long life', *Gerontology*, 1969, 9: 226–8, p. 227.

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maintenance of health or just for its own sake, was little known and applied less.¹⁰ The pursuits encouraged in the Middle Ages because of their military value had lost their importance as guns replaced swords and bows and arrows. Archery survived but only as a sport and fencing contests became the sole legacy of medieval jousting tournaments. In an era in which servants were both readily available and easily affordable, physical activity in connection with either work or home was virtually unknown even among people whose means were only moderate. As far as the middle and upper classes were concerned, exercise was confined for the most part to a limited range of participatory sporting activities, and to travel, whether on foot or horseback. All of these activities had to compete with less desirable spectator pursuits such as patronage of cock fighting bouts and bull baiting displays or attendance at public hangings.¹¹

Earlier linkage of games with religious holidays such as Easter had declined in popularity by the eighteenth century. On the other hand, the restrictions on sporting events and games imposed by the Puritans during the Commonwealth era had largely disappeared after the 1660 Stuart restoration. Authorities of the established church accepted and even encouraged Sunday sports, in part as legitimate pastimes in their own right and in part in order to divert their flock from other activities that were considered less desirable. Fields for sports were often available on the outskirts of towns. Some events, such as horse-racing, wrestling and boxing, were essentially spectator pursuits. The choice of participatory activities reflected the class divisions of the time. There were sports such as football in which the common folk took part and other activities that engaged all strata of society, such as foot races, whether on level ground or including hurdles. Hunting, as a “courtly” exercise and “gentlemanly” pastime, was reserved largely for the nobility and the gentry. It involved participation but provided exercise infrequently and less intensively than today. Hunting hares was common and for the hunter less taxing than the current pursuit of foxes. Neither horses nor hounds had been bred selectively to any extent and both were slower than they are now. Among the middle class, early forms of golf, cricket and tennis were played and enjoyed some limited popularity. Water events such as swimming, rowing and yachting had enthusiastic participants and the primitive forms of exercise machines that were available were occasionally used at home.¹² With the exception of horse riding, these activities were exclusively masculine, their pursuit was less intense than now and far from universal, and they were usually discontinued in middle life. That George Osbaldeston and Assheton Smith still hunted to hounds, the former when nearly forty-five, the latter at age fifty-four, was remarked upon by contemporaries as highly exceptional.¹³ There is, however, no evidence to indicate any change in the extent to which these sporting activities were pursued as Stuart times were succeeded by Georgian.

¹⁰ L Picard, *Dr. Johnson's London*, London, Weidenfeld and Nicolson, 2000, pp. 126, 129.

¹¹ A S Turberville (ed.), *Johnson's England*, 2 vols, Oxford, Clarendon Press, 1952, vol. 1, p. 366.

¹² W J Baker, *Sports in the western world*, Urbana and Chicago, University of Illinois Press, 1988, pp. 66, 67.

¹³ G M Young (ed.), *Early Victorian England*, 2 vols, London, Oxford University Press, 1934, vol. 1, p. 266.

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During the eighteenth century there were significant developments in travel patterns and in their impact on levels of physical activity. During the Middle Ages, roads, even between important cities, had been little more than muddy potholed tracks. The old Roman roads had been neglected and had deteriorated badly. The construction of medieval roads consisted for the most part of removal of trees and undergrowth and the clearing of obvious obstructions such as boulders. The road surfaces were little more than beaten earth so that they were dusty in summer, muddy in winter and deeply rutted at all times. Even the most luxurious of coaches, available only to the wealthy and then used almost exclusively by ladies, were heavy, clumsy and exceedingly uncomfortable. The wheels were solid and neither the body of the coach nor the seating had springs. Every jolt in the uneven and potholed tracks was transmitted to the unfortunate passengers. Because roads were narrow, passage of vehicles travelling in opposite directions was hazardous. Horse litters were used by the wealthy but had the added disadvantage of close confinement for their passengers.¹⁴ For the less affluent travel was even more uncomfortable; for them there were only wagons which were often without cover. Travel was exceedingly slow. In 1575 a wagon took two and a half days for the journey from London to Cambridge, averaging about two miles an hour.¹⁵ For young children, the elderly and the infirm, there was no choice. For others, there was the alternative of walking for neighbourhood journeys, and in fact people did walk very considerable distances. For many it was virtually their sole form of exercise, taken because of necessity. For long journeys, horseback was the only other possibility and provided the rider with a measure of physical exertion, currently estimated to average 2.6 METS for walking, 3.0 to 6.5 for trotting and 8.0 METS for galloping.¹⁶ One of Fothergill's patients with angina pectoris developed the typical pain when riding a horse at any speed faster than a trot and he had to stop his mount in order to obtain relief.¹⁷

There was little improvement in either the roads or the means of travelling on them during Tudor and early Stuart times, but major changes followed passage of the first Turnpike Act in 1663. This transferred responsibility for maintenance of roads from local authorities to Turnpike Trusts which were able to recoup the money spent on improvements by charging tolls. The system worked only imperfectly as many trusts were underfunded or maladministered. Payment of tolls was sometimes evaded, frequently with the connivance of tollgate keepers who were less than totally incorruptible.¹⁸ Nevertheless, the late seventeenth century saw a beginning of road improvement and the pace of change accelerated greatly during the eighteenth with the development by mid-century of what has been described as "turnpike mania". Although the greatest changes in road surfacing awaited the efforts of Thomas Telford and John Macadam in a later period, the improvements during the early

¹⁴ J Joyce, *The story of passenger transport in Britain*, London, I Allen, 1967, p. 28.

¹⁵ *Ibid.*, p. 3.

¹⁶ William Haskell *et al.*, 'Task force II: Determination of occupational working capacity in patients with ischemic heart disease', *J Am Coll Cardiol*, 1989, 14: 1025–34, p. 1028.

¹⁷ John Fothergill, 'Case of an angina pectoris with remarks', *Medical Observations and Inquiries*, 1776, 5: 233–51, p. 245.

¹⁸ William Albert, *The turnpike road system in England 1663–1840*, Cambridge University Press, 1972, p. 19.

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eighteenth century were considerable. Foundations of faggots or brush were laid and stones, gravel and sand were used for surfacing and packed down for hardness. Road surfaces were cambered for drainage, which was further improved by ditching along the sides. Wear was reduced by penalizing owners of exceptionally heavy vehicles and controlling wheel width. Ferries were replaced increasingly by bridges. By 1750 towns throughout the length and breadth of England were linked by a network of the new roads and served by scheduled stage-coach services.¹⁹

The same period saw considerable improvements in vehicle design. Steel springing was introduced to reduce jolting and seating became more comfortable. Greater strength and stability of construction made it possible to seat passengers outside as well as inside the coach. Increased wheel width gave added stability. The pulling power became greater as selective breeding and improved feeding resulted in stronger horses. The harnesses and traces were improved so that it became possible to link four or even six horse teams to the coach. The coachman no longer walked with the horses. He now sat in a special box in the front of the carriage so that for the first time the capacity of the horses rather than the walking pace of the man determined the speed which could be maintained. It increased from about two miles an hour in the sixteenth century to ten by the end of the eighteenth. The journey from London to Manchester, which took four and a half days in 1754, required only three in 1760 and two by 1776.²⁰ Travel times between other cities became correspondingly less.

The improvement in transport did not impact on the physical energy expended by passengers who had always ridden long distances by coach. It simply increased their comfort, speed and convenience and perhaps diminished the danger of hold-ups by highwaymen. However, for others, it did encourage the use of stage-coaches or post-coaches in place of riding on horseback. More importantly, for short distances it encouraged travelling by carriage rather than walking. The children and grandchildren of people who had journeyed by coach from London to York in the seventeenth century would have used the same means in the eighteenth. However, someone whose forebears had walked the twelve miles from Bath to Bristol in Stuart times might well have taken a coach a century later. Excursions by carriage replaced some walks undertaken for pleasure and without a specific destination. Even before the end of the seventeenth century, the antiquarian John Aubrey had remarked that gentlemen were travelling in carriages instead of on horseback as previously. A 1779 observer complained of "indolence ever worsening among civilized society with the neglect of going on foot; the encrease of carriages, the high finishing of roads".²¹ Short journeys were facilitated by a great variety of new vehicles that became available for the purpose, especially for travel within towns. They were owned in ever larger numbers by the lesser gentry and the commercial classes and included the gig, the barouche and, for the adventurous, the phaeton. There were also vehicles for hire, notably the post-chaise and the hackney carriage. The increase in their number during the Georgian era is well documented as many types of carriage had

¹⁹ *Ibid.*, pp. 133ff.

²⁰ Joyce, *op. cit.*, note 14 above, p. 197.

²¹ W Grant, *Some observations on the origins, progress, and method of treating the atrabilious temperament and gout*, London, T Cadell, 1779, p. 4.

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to be licensed because they were subject to taxation. In eighteenth-century London sedan chairs too were available for hire. They had first come into use in France in the mid-seventeenth century, were introduced into England shortly afterwards and became very popular during the next hundred years. They spared their patrons fatigue and the porters who furnished the motive power also provided protection against assault and robbery. The attraction of all the new forms of transportation was further increased by the tendency for streets in the better parts of the larger cities to be paved to an ever greater extent during the course of the eighteenth century.²² Towns were growing in population and area, and in London fashionable new suburbs such as Bloomsbury and Marylebone were extending to the north and west of the city.²³ The resulting dispersion added to the distances that had to be travelled for local purposes, whether social or business, and thereby increased the attraction of riding as compared to walking. The combined impact of all these changes on regular physical exertion was not far removed from that which resulted two centuries later from the growing use of the motor car. In the eighteenth century, as in the twentieth, riding replaced walking.

In conclusion, historical evidence suggests that during the eighteenth century the intensity of exercise associated with formal sports probably continued at a low level, and their popularity remained more or less unchanged. Growth in the size of the middle classes resulted in an increase in the number of people who could replace their own exertions with the labours of their servants and substitute the ease of a conveyance for the effort of either walking or riding on horseback. In light of the evidence now linking lack of exercise to predisposition to coronary heart disease, a decline in middle- and upper-class physical activity during the Georgian era could well have been a factor, not perhaps the greatest, but contributing in some measure to the emergence and subsequent increase in incidence of angina pectoris observed at the time.

²² Joyce, *op. cit.*, note 14 above, pp. 114ff.

²³ George Macaulay Trevelyan, *English social history*, 3rd ed., London, Longmans, 1947, p. 592.