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Physical Activity and Health: Current Issues

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Abstract – This paper is concerned with future contributions by research to an evidence-based rationale for exercise recommendations—both to the public at large and to individuals. It is clear that physically active people have a lower disease risk than sedentary individuals but the components of activity which determine particular health gains are poorly understood. Thus the 'dose-response' relationships for physical activity are the subject of current research interest. Intuitively, these will not be the same for different health outcomes and this is one reason why further study of the associated mechanisms is important. Understanding the underlying mechanisms will clarify the relative importance of intensity, frequency, duration and mode of exercise for specified health gains. It will also help us to distinguish the effects of exercise per se from those of co-existing behaviours and to identify stages of life during which levels of particular types of activity are critical for given health outcomes.

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INTRODUCTION:-

A substantial body of evidence now demonstrates the burden of ill-health attributable to sedentary living. This is most compelling for coronary heart disease (CHD) and, combined with the high prevalence of inactivity, provides the rationale for Professor Morris's claim that exercise is 'today's best buy in public health. Besides a reduced risk of CHD, evidence is secure for many other health gains from physical activity; these include a reduced risk of stroke type II diabetes colon cancer and hip fracture. There is evidence enough to justify the further development of public health policies to promote physical activity. The difficulty is with the specifics of what to promote and prescribe.

IMPORTANCE OF INTENSITY

The intensity of exercise likely influences some of its effects on disease risk but the difficulty of defining and then measuring this in a meaningful way has restricted progress. More uniformity has been evident in recent years with the widespread adoption of the MET but this is, of course, an absolute index of intensity and most physiological responses to exercise are governed by the relative intensity of the exercise. An intensity of 10 METS might be a warm-up for one person but require a near-maximal effort for another. During the second half of the 20th Century, exercise physiologists have most commonly expressed intensity relative to the individual's maximal oxygen uptake (V•O2max). Whilst this approach is valid across a broad range of fitness levels, it is inadequate for individuals with low functional capacity for whom the resting metabolic rate represents a higher fraction of V•O2max. For these individuals—who of course make up the majority of sedentary people—intensity is better expressed relative to oxygen uptake reserve. To the author's knowledge, this concept has been adopted only in scientific (as opposed to epidemiological) studies.

Its importance in the epidemiology of physical activity is evidenced by data from British civil servants. Whereas only frequent vigorous exercise (defined as liable to entail peaks of energy expenditure of =7.5 kcal.min–1 [31.5 kJ.min–1]) was associated with protection against heart attack in men aged 45–54 at entry, there was a dose-response relationship for a lesser degree of such exercise (either <2 sessions per week or not so intense, e.g. 'fairly brisk' walking for >30 min. per day) among older men aged 55–64 at entry. Thus, for example, older men reporting moderately intense activity such as 'much stair climbing' (not judged sufficiently vigorous to be included in the 'vigorous aerobic' cluster of activities) showed a coronary rate which was significantly lower than that in less active men. Protection among younger men was limited to those reporting frequent vigorous aerobic exercise. This finding suggests that the key features of cardio-protective exercise include its intensity relative to individual capacity. V•O2max declines, on average, by about 10% per decade in middle-aged and older people, so exercise of a given MET value represents a higher relative intensity for older people. Where the number of individuals surveyed permit, one approach may be to express the MET value of the activity in relation to age-related average values for oxygen uptake reserve.

FREQUENCY OF EXERCISE

Recent recommendations are for exercise on '… most, preferably all, days of the week', underlining the

importance of frequent exercise. This notion reflects increasing recognition of the acute effects of exercise, i.e. altered physiological or metabolic responses lasting between several hours and a few days after a session of exercise. These include a decrease in blood pressure improved insulin sensitivity and decreases in plasma triglycerides. The time-courses over which they disappear are poorly understood, however. Some information is available, for example the attenuation of the postprandial rise in plasma triglycerides following a standard high-fat meal has been reported to disappear within 60 hours of an exercise session. Improved insulin sensitivity may persist for a little longer. More information is required, however, as the duration of these effects dictates the frequency with which exercise sessions must be taken if favourable postprandial responses are to be maintained. Similarly, the determinants of the magnitude of acute effects of exercise need to be elucidated. Theoretically, this may be enhanced by training because training permits more frequent and longer exercise sessions to be accomplished without fatigue. To the author's knowledge, this proposition has seldom been tested.

PATTERN OF EXERCISE

Epidemiological studies have found an inverse relationship between the total energy expended in leisure time physical activity and health outcomes. These include a lower risk of all-cause mortality cardiovascular morbidity and mortality type II diabetes hypertension and site-specific cancers. Some activities contributing to high totals of energy expenditure seem likely to have been performed at least partly on an intermittent basis, for example walking, climbing stairs gardening and repair work. Survey evidence therefore suggests that several short sessions of moderate physical activity during the day influence health outcomes in a positive manner, at least when they contribute to a high total energy expenditure.

Scientific evidence for the efficacy of this pattern of exercise as a means of eliciting chronic (training) effects is limited however, both in the number of randomly controlled trials (three to the author's knowledge) and scope (the only common outcome measure was fitness). Evidence is limited to scientific studies with outcome measures primarily of fitness and/or fatness. Only one study reported the effect of exercise pattern on acute health-related responses. This found similar reductions in plasma triglycerides with three, 10-minute bouts of brisk walking at intervals during the day and one, 30-minute bout in sedentary people consuming normal meals.

ENERGY EXPENDITURE AND ENERGY TURNOVER

The product of intensity, frequency and duration of exercise—sometimes described as the total 'volume' of exercise (a difficult term)—yields the total gross energy expenditure. Some evidence points to this as an important determinant of health gains. In addition to the surveys referred to above, this includes the finding from the US Runners' Health Study that running mileage was six times more important in predicting high density lipoprotein cholesterol concentration than running speed. This was not the case for associations with blood pressure or waist circumference, however, where running speed was the more important determinant. Total energy expenditure may also be the main determinant of some acute effects of exercise. Two examples are relevant. First, the increase in glucose disposal rate was similar following exercise at 50% or 75% V• O2max when the total energy expended was held constant. Second, the attenuation of postprandial plasma triglycerides by prior exercise was strikingly similar following a long bout of low intensity exercise and a shorter bout of moderate exercise expending the same energy. This topic, again under-researched, is related to that of the accumulation of exercise (referred to above) because that enshrines the notion that the total energy expenditure is all-important.

Of course, in free-living people, an increased level of physical activity is invariably associated with an increase in energy intake so that energy turnover is increased. Speculatively, a higher energy turnover may constitute a metabolically desirable state because of effects on the pathways concerned with the disposition, storage and degradation of muscle energy substrates. Evidence for the health gains from such a state include the finding that men who were classified as obese by body mass index (BMI) but who had a high level of physical fitness had lower cardiovascular and total mortality rates than lean men who were unfit. Similarly, although both high BMI and a high energy intake were associated with increased risk of colon cancer among inactive people, this was not the case among physically active individuals. This finding suggests that a high energy intake does not confer increased risk of this cancer in the presence of a high expenditure.

The suggestion that a high energy turnover is metabolically advantageous is not new. The term 'metabolic fitness' was introduced by Disperse and Lamarche on the basis of a series of studies showing that change to plasma lipoprotein lipids and body fatness were achieved through high-volume, low intensity training in the absence of increases in V•O2max. Efforts to test this hypothesis through comparing the effects of 'lifestyle' activity with those of traditional exercise programmes have recently been reported but information is needed for a variety of health outcomes in different populations.

FITNESS

Over the last decade, epidemiological data on physical activity (a behaviour) has been complemented by findings based on physical fitness

(a set of attributes related to the ability to perform exercise). These studies show a dose-response relationship so that, although men in the highest fitness groups consistently show the lowest coronary attack and total mortality rates, moderate levels of fitness also confer a statistically significant and clinically important reduction in risk. Physical fitness, because it is probably a more objective measure than physical activity is an attractive outcome measure. Its use could be extended of course if it could be measured satisfactorily outside the laboratory. A low-cost, rapid, non-intimidating method for this would allow large surveys with the statistical power to detect, for example, effects in sub-groups and effects of specific activities. Walking tests such as the UKK Institute's 2 km protocol are attractive for both practical and theoretical reasons. Performance on these tests measures not only functional capacity (V•O2max, the most frequently used laboratory measure), but also endurance. This is defined as the capability to sustain aerobic exercise using a high proportion of V•O2max. Endurance is more sensitive to changes in physical activity level than V•O2max and, because it derives largely from metabolic adaptations in muscle, may be a more important determinant of related health gains.

As mentioned, epidemiological studies show associations between fitness and a variety of health outcomes. The need to elucidate the relationships between the 'dose' and pattern of activity and the health outcome has been mentioned above. Fitness (particularly endurance) is labile and so rather easily changed through short-term interventions. It therefore offers a means of studying these dose-response relations indirectly (but inexpensively), serving a link between the behaviour and health outcomes.

WALKING

Most epidemiological studies have classified physical activities according to estimated energy expenditure—either totals or threshold rates. Recommendations to the public (whether direct or via health professionals), however, need to promote activities rather than energy expenditures. Walking is an obvious example. It is popular, inexpensive and carries a low risk of injury. It is often the most commonly reported activity, particularly among women and older men. Some landmark studies, including those by Professor Morris's group have published separate analyses for walking. In British civil servants brisk walking accounted for over half of the exercise which was protective against heart attack in 55–64-year-old men. Protection from attack among fairly brisk walkers was not significantly affected by controlling for participation in sports and cycling or for a lot of other CHD predictive factors. In recent years more data has become available, however. In the US Nurses' Health Study, for example, walking was inversely associated with coronary events; women in the highest quintile group for walking (=3 h per week at a brisk pace) had a multivariate relative risk of 0.65 (95% CI : 0.47–0.91). Similarly, healthy older men in the Honolulu Heart Study who walked >1.5 miles per day had half the coronary risk of those who walked <0.25 miles per day. Walking has also been reported to be associated with a lower risk of type II diabetes (independently of participation in vigorous activity).

These observations are consistent with reports that moderate levels of fitness, associated with a reduction in all-cause mortality, are attainable through brisk or fast walking. Bearing in mind that sedentary people seldom exert themselves at more than 30–35% of V•O2max such walking is sufficiently vigorous to improve fitness in a majority of people whose health is at risk because of their inactivity.

Walking is especially suitable for older people and the functional gains it elicits will likely improve quality of life. It is plainly acceptable for them, and carries a low risk of injury. In 13 weeks of training by walking, only one injury was sustained among 57 healthy men and women their 70s. Among older people, regular walking has been associated with lower rates of hospitalization lower plasma triglycerides and higher bone mineral density.

CONCLUSION

Physical inactivity is a waste of human potential for health and well-being and its high prevalence is a cause for concern. Its potential contribution to positive health (not merely the absence of disease but associated with a capacity to enjoy life and to withstand challenges) is considerable. So much is known—yet we need to understand much more. The effective 'dose' of exercise needed to elicit effects likely to be of clinical importance must be defined and this information translated into practical advice readily understood by the population at risk. Ten years after Professor Morris's plea for 'physiology and epidemiology to get together the need for co-operative efforts from these disciplines is even more urgent.

REFERENCES

Cummings SR, Nevitt MC, Browner WS et al. (1995). Risk factors for hip fracture in white women. N Engl J Med ; 332: pp. 767–73. Cross Ref Medline Web of Science.

Dargen-Molina P, Favier F, Grandjean H et al. (1996). Fall-related factors and risk of hip fracture: the EPIDOS prospective study. Lancet ; 348: 145–49. Cross Ref Medline Web of Science

Giovannucci E, Ascherio A, Rimm EB, Colditz GA, Stampfer MJ, Willett WC. (1995). Physical activity, obesity, and risk for colon cancer and adenoma in men. Ann Int Med ; 122: pp. 327–34. Cross Ref Medline Web of Science.

Haapanen N, Miilunpalo S, Vuori I, Oja P, Pasanen M. (1997). Association of leisure time physical activity with the risk of coronary heart disease, hypertension and diabetes in middle-aged men and women. Int J Epidemiol ; 26: pp. 739–47. Abstract/FREE Full Text.

Helmrich SP, Ragland DR, Leung RW, Paffenbarger RS. (1991). Physical activity and reduced occurrence of non-insulin-dependent diabetes mellitus. N Engl J Med; 325: pp. 147–52. Cross Ref Medline Web of Science.

Lee I-M, Paffenbarger RS. (1998). Physical activity and stroke incidence. The Harvard Alumni Health Study. Stroke ; 29: pp. 2049–54.Abstract/FREE Full Text.

Morris JN. (1994). Exercise in the prevention of coronary heart disease: today's best buy in public health. Med Sci Sports Exerc ; 26: pp. 807–14. Medline Web of Science.

National Fitness Survey (1992). Main Findings. London: Sports Council and Health Education Authority.

Slattery ML, Potter J, Caan B et al. (1997). Energy balance and colon cancer—beyond physical activity. Cancer Res ; 57: pp. 75–80. Abstract/FREE Full Text.

Wannamethee G, Shaper AG. (1992). Physical activity and stroke in British middle-aged men. Br Med J; 304: pp. 597–601.