

CHAPTER 22

Key issues in physical activity and overfatness

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Introduction

Exercise and obesity has endeavoured to juxtapose the physical activity with a key component of body composition, namely fat. The reasons for interest in body fatness in contemporary societies range between the cosmetic and health with exercise being relevant in every case. But the health-encouraging potential of exercise has in its own right given it an importance quite apart from its relation to body fatness. This assertion is underscored from several vantage points in this book.

Fitness and fatness are topics of great interest to the lay individual as well as to a large range of health professionals including those who work in exercise and sports science, physical education, medicine, nutrition and other health fields.

Throughout this book, attention has been drawn to key issues related to exercise and to obesity. They are brought together here in the final chapter by way of convenience for the reader.

Section 1. Setting the scene

Exercise as a primary treatment for obesity has a poor record, but regular walking and/or running can reduce intra-abdominal fat and improve the related metabolic profile

The overfat may experience considerable discomfort with exercise.

Initial treatment for the very overfat should commence with dietary modification followed by exercise at a later date. At least initially, weight-supported exercise is preferred.

Aerobic exercise has numerous beneficial effects including the role of skeletal muscle in the oxidation of fatty acids (see Section 3 as well).

Section 2. Genetic and social framework for a physical activity and body fatness interplay

Major demographic factors, including ageing of populations, are affecting the international profile of obesity

Even though most attention has been paid to an increase in total fatness across communities, the distribution of fatness is also changing.

The food determinants of total body fatness may not be the same as the food determinants of body fat distribution.

Levels of physical activity decline with age and body composition tends to alter in the direction of decreased lean mass and increased fat mass

In some of those regions of the world where the prevalence of protein energy malnutrition remains considerable, there is also an increase in the prevalence of obesity.

The 1980s saw a substantial increase in obesity in middle-aged and post-menopausal women.

Enquiry of a socio-anthropological kind is required to see an overall relationship or connection between the phenomena of decreasing levels of physical activity and increasing obesity.

Some groups express abdominal fatness early in the course of an increase in total body fatness.

Those studies which have examined energy intake prospectively as a predictor of coronary or total mortality, show it to be positively and favourably determining of mortality.

Disease outcomes that may be prevented or whose course may be changed by addressing the underlying reversible factors of physical activity and food intake include cardiovascular disease, diabetes and impaired glucose tolerance, osteoporosis, psychological disorder, possibly certain cancers and neoplastic diseases.

Higher levels of energy intake and physical activity are often associated with lesser degrees of fatness and opportunities for prevention of the problem should emphasise these considerations.

There is considerable support for the notion that childhood obesity 'tracks' through to adulthood

There has been a steady increase in BMI scores of school-age children (eg in Australia) for much of this century. Insufficient data make it difficult to clarify this trend. A likely explanation is an energy imbalance over time.

Results of studies indicate a reduction in mean energy intake over time.

Historical accounts suggest a marked decline in habitual physical activity of Australian children. A number of North American studies have documented a similar decrease.

Regular physical activity is a simple and useful lifestyle practice to prevent overfatness

Evidence for and against a useful role of exercise in prevention and treatment of overfatness is best understood when genetic factors are also considered.

Multifactorial phenotypes result from a complex interplay of genetic and environmental factors.

A positive energy balance over an extended timeframe results in an increase in fatness.

The short-term relationship between energy intake and expenditure is poor compared to the higher correlation between these factors in normal weight individuals.

High levels of energy intake do not appear to result in positive energy balance for some, but in others, low energy intake and sedentary lifestyle results in weight gain.

Variations in the biological/behavioural interface can be caused by inherited or acquired conditions.

A critical determinant of total body energy content for stature is nutrient partitioning.

The energy content of body fat is approx. 38.9 MJ per kg whilst fat-free tissue reaches only 4.3 MJ per kg.

The body mass index provides an indication of heaviness and indirectly, body fat.

Results of the genetic effect are quite variable.

Most studies with nuclear families or adoption data report heritability levels of approximately 20–30%. However, twin studies report estimates as high as 60–90%.

Overall data indicate the BMI does not have a large heritability component.

Studies are inconclusive in determining the presence of a major gene for percent body fat.

Some individuals are more at risk than others to gain fat when an energy intake surplus is standardised with subjects remaining sedentary.

High-volume low-intensity endurance exercise completed regularly increases energy expenditure, improves insulin sensitivity, plasma lipoprotein profile and blood pressure.

Environmental factors constrain or embellish the expression of genetic potentialities

Economic abundance enables shifts in the energy intake and expenditure that favour overweight in those who possess the genetic predisposition toward obesity.

The relationship between socio-economic status and obesity is in part mediated by perceptions of ideal body weights.

Social sanctions for attaining or failing to attain an idealised body type are exercised more prominently for women than for men.

Obesity is rare in most nonindustrialised societies.

Commercial food manufacturers in industrialised societies provide new inducements toward obesity.

Body weight is a primary element of the standards of physical attractiveness by which humans everywhere are judged.

It has been argued that today's cultural obsession with slimness has distorted or inflated perceptions of the actual medical hazards associated with obesity.

The most valued body shape is that which is most beneficial in thwarting the causes of mortality that predominate in a given society.

In cultures of affluence, as contrasted to those of poverty, it is easy and unhealthy to become overweight and difficult to remain thin.

Whether obesity is idealised or stigmatised depends on gender, social status and sociocultural context.

In some ethnic groups, overfatness (corpulence) is equated with power, wealth and prestige

Indications are that general recommendations regarding the need for control of body weight have not been very successful.

A number of studies have indicated an association between body weight and socio-economic status.

Generally, although not consistently within societies, lower social class equates with higher body weight.

Nutritional knowledge is often lacking in overfat individuals.

Are obese individuals socially isolated because of their overfatness or does their tendency to isolate themselves lead to overeating for consolation or may both occur?

If obese individuals eat out less frequently than normal weight individuals efforts to impact eating habits in restaurants and food outlets may be ineffective.

Obese subjects regularly report a decreased participation in leisure time activity.

Popular magazines are often criticised for their irresponsible attitude to weight problems. A more systematic educational use of such information channels could greatly assist lifestyle changes.

The societal perception of female beauty has changed gradually from a body form with voluptuous curves to a more angular and leaner shape.

Analyses of participants in beauty contests are suggestive of weight reductions over time of at least 6.5 kg.

Young children consistently rate overfat individuals as being less desirable.

Some researchers have suggested that attitudes to obesity are not formally taught but that the mass media must carry a good deal of responsibility for such negative attitudes.

Ignorance of the condition and lack of desire to provide assistance is prevalent amongst health care professionals.

Social stigmatisation is also present in occupational life.

The 'television diet' of the Western world is not consistent with principles of sound nutrition.

Television actors reflect the leanness present in beauty contests and popular magazines.

Obese individuals do not exhibit more psychopathology than non-obese individuals.

Very few people who are overfat set out striving to attain this excess.

Section 3. Metabolism and physiology of exercise and body fat

The regional distribution of fat may be more important than absolute excess of adipose mass

Abdominal obesity is associated with an increased risk of metabolic disturbances.

Computed tomography (CT) allows precise and reliable measurement of deep and subcutaneous adipose tissue at any body site.

The amount of deep abdominal adipose tissue is the best correlate of glucose tolerance.

Regional adipose tissue distribution has also been reported as a correlate of plasma and lipid levels.

There is a complex network of hormonal and metabolic interactions associated with changes in plasma lipoprotein levels observed in abdominal obesity.

Fat-free mass is generally preserved by endurance exercise training and loss of body weight is mainly explained by the reduction in body fat mass.

Exercise training may produce significant metabolic improvements in abdominal obese individuals even with little alteration in body fatness.

No reduction in body fatness is needed to see benefits of exercise on metabolism.

Improvement in CR (cardiorespiratory) fitness appears to be dissociated from adaptation of carbohydrate and lipid metabolism to endurance training.

Emphasis should be placed on 'metabolic fitness'.

Intervention should stress the improvement of health-related fitness in abdominally obese subjects.

Therefore, regular exercise at approx. 50% VO₂ max will have significant metabolic effects, despite failure to improve cardiorespiratory fitness substantially.

Walking for at least one hour on most days represents the best exercise prescription for most obese individuals.

It is difficult for exercise alone to yield significant fat loss except with highly motivated individuals

Generally, men involved in physical training have more success in body fat reduction than women, women may compensate to protect their body fat.

Exercise has a protective effect on fat-free body mass.

The available literature regarding the role of exercise in improving weight loss in women is often conflicting.

It is possible to normalise metabolic profiles with exercise and low-fat diet.

In contrast, studies have found no advantage to weight loss with diet and exercise combined, although fat loss may be advantageous.

Strength gains for exercising subjects who are overfat has been identified as an advantage.

Increased exercise during treatment can result in increases in body weight through increases in fat-free mass.

Diet counselling seems to assist in exercise adherence.

There are numerous benefits of exercise other than weight loss.

Regular exercise plus low-saturated fat diet improves plasma lipoprotein levels.

Mild exercise such as walking is excellent treatment for overfatness and hypertension.

Data on the benefits of exercise on weight loss in children are somewhat conflicting.

Low level of habitual physical exercise is cited by many as a cause of overfatness in children. Others suggest that neither high-fat food nor low levels of activity are independent risk factors. Perhaps several 'risk factors' have a synergistic effect.

Unfortunately, most studies considering the effect of exercise on mood have not been with obese subjects.

The means by which the body achieves the regulation of energy balance may be the critical factor in the process of weight maintenance which remains poorly understood

Increases in metabolic rate accompany exercise along with improvement in lipid oxidation, glycogen storage and a reduced glucose oxidation. The thermic effect of food can be partitioned into obligatory and facultative components.

Weight loss programs need to ascertain an individual's desire to lose weight as well as a realistic program of negative energy balance with defined short- and long-term goals of success.

Long-term prospective studies have demonstrated the dose relation effect of increasing energy expenditure on reductions in mortality.

Measures to control energy balance must consider other factors aside from weight.

Success in the achievement and maintenance of fat loss requires behavioural change to effect long-term solutions for the required negative energy balance.

An adequate level of physical fitness is essential to health

Participation in physical activity from an early age is the key to the prevention of overfatness.

Habitual physical activity in young children will help to translate to activity throughout life.

The impact of overfatness was not pronounced in the early years but may be expected to worsen if overfatness is sustained over an extended timeframe.

Overfat adolescents are disadvantaged in aerobic tasks, particularly where a transference of body weight is required.

Greater physical size of most overfat youngsters is a distinct disadvantage. Even though gross muscular strength is greater, strength per kilogram body mass is lower.

Individuals who are extremely overfat should not be prescribed weight-bearing exercise initially. Rather, activity in which the body is supported (such as swimming), is preferred.

As confidence improves, participation should be more spontaneous and initiated by the individual.

Long-term therapy should be individualised wherever possible and combine physical activity with dietary intervention.

Obesity management in adulthood provides a considerable challenge. Increases in fatness bring an increase in potential risk of participation in exercise.

Exercise tolerance of younger children can assist in effecting positive improvements in physiological capabilities in a shorter timeframe.

Functional testing helps to ensure the most accurate assessment of physical status and individualised prescription of activity.

Every attempt should be made to prevent early excesses of fat deposition. An early exposure to the benefits of regular physical activity is essential.

Obese individuals experience increased loading on major joints, they also experience an increased energy expenditure for the same movement task when compared with lighter counterparts

Early movement analysis may be advantageous in obesity management: analyses may enable the recognition and amelioration of gait abnormalities before damage to tissues and structural deformities occur.

Coping with overfatness: increased time carrying additional weight may be positively correlated with movement difficulties. A weight threshold may be an important factor for each individual.

Improvements in temporal parameters of walking are possible following the attainment of more desirable body composition.

Section 4. Assessment of fatness and strategies for avoiding overfatness with age and amongst special groups

Numerous indirect methodologies exist for the assessment of body composition

Each of these processes possess some limitations. For many, lack of established validity is a major shortcoming. Nevertheless value judgements need to be made in relation to the best techniques for particular applications.

Some of the anthropometric techniques are appropriate for self-monitoring of fatness and are also useful given the utilisation of skilled research personnel. The Body Mass Index and summed skinfold measures fall into this category.

Even though there is a widespread usage of nutrition education there is little precise definition of what nutrition education aims to achieve in weight control

Nutrition knowledge and improvement in nutrition knowledge are not strong determinants of weight loss and control of weight.

In instances where nutrition education effects an improvement in eating behaviour there is not a substantial effect on weight loss.

Future work with nutrition education in weight loss therapy should be more selective.

Obesity during childhood and adolescence is very resistant to treatment

Strategies that seek to influence parents' feeding practices or childrens' eating habits must take into account psycho-social issues.

Intervention should be commenced with an initial assessment of the fat child and family to appraise the basis for obesity and factors influencing likely response to intervention.

An accurate assessment should serve to educate the family and provide a forum to discuss preventive principles.

Endocrine dysfunction can be discounted if a child has a normal growth rate appropriate to family height characteristics.

Intervention may be unrewarding in some cases where there is a strong constitutional basis for the obesity.

The accurate assessment of diet is very difficult in childhood.

High energy sources should be readily modified – be conscious of sweet drinks, fruit juice and foods high in fat.

There is a rapid decline in the habitual physical activity of many teenage girls irrespective of their weight status.

Exercise scientists have an important role to play in both the assessment of fitness status and prescription of physical activity.

The secondary effects of obesity are often more concern for many children and their families than obesity itself.

A strong desire to lose weight does not necessarily equate with a resolve to eat less or exercise more.

Strategies should be planned on an individual basis.

Reassurance about health status and advice on a healthy lifestyle may be preferable to formal intervention for the following: those with moderate obesity have constitutional factors predominate and where weight gain does not outstrip normal growth.

The proliferation of popular fad diets is testimony to their ineffectiveness.

Dieting may be totally inappropriate for children. Dietary restriction during growth is potentially hazardous.

A non-restrictive diet program has more chance of success.

The inert fat load carried by an obese child will lead to an increased energy expenditure for a given weight bearing activity.

Activity programs should be individualised. Continued participation in physical activity should be self-managed rather than relying on other options.

Parental involvement is critical to the success of intervention programs.

Behaviour modification, physiological support and parental involvement are key components for successful programs.

Up to approximately 75 years of age overfatness remains a problem in women. In men, however, underweight is as much a problem as overweight between the ages of 65 and 75

The BMI is not a reliable indicator of relative fatness for individuals over 70 years of age. Body fat levels are higher for comparable body weight values.

Body composition changes dramatically during the adult years. Relative fat-free mass decreases whilst fat mass increases. Distribution of body fat changes from more subcutaneous to more visceral (internal) fat.

Over 60 years of age the effect of body weight on mortality is, by contrast, unclear.

Lifestyle habits need to emphasise improvements in eating and physical activity

Individuals who are anxious or angry often dispel this by eating.

Overfatness in developed societies is more prevalent in lower SES (socio-economic status) groups. Factors included as possible mediators of difference are: dietary restraint, physical activity, social mobility and inheritance.

Overfatness results in severe stigmatising of many individuals. There is a tremendous social pressure to be thin.

More emphasis should be placed on a positive program (exercise) rather than a restrictive regime (dieting).

Long-term weight loss remains a problem, irrespective of strategy employed.

Cognitive re-framing involving positive reinforcement is important: 'be hungry to lose weight'.

Optimum body weight and body fat levels vary from sport to sport and even with positions or specific events within the same sport

Overfatness (whether real or imagined) is one of the most common reasons for an athlete to seek dietary advice.

Athletes have the same misconceptions about body composition, and about safe and long-term methods of reducing body fat as the general population.

Decisions to reduce body fat are often made for improvements in health, general fitness and appearance, rather than direct benefits to performance.

The advantages of low body fat levels include physical and mechanical gains, whereby decreases in body fat cause an increased 'power to weight' ratio. In addition, low fat levels may also be important for aesthetics and appearance in sports such as gymnastics, diving or ballet.

The optimal body fat level for an athlete should meet the following criteria:

- be associated with (consistent) good performances
- promote good health, including absence of 'underweight' or overtraining

While the current fashion amongst some athletic groups is the achievement of minimum body fatness, athletes are warned about the possible lack of improvement from lowered body fat levels, as well as the potential for harmful side-effects.

There are few studies which isolate and test the benefit of various body fat levels, or the safety and effectiveness of weight loss techniques on sports performance.

Obesity is not limited to the able bodied population but is frequently associated with disabling impairments such as spinal cord injury, brain injury and cerebral palsy

In addition, traumatic amputations and other orthopaedic disorders frequently result in inactivity and subsequent accumulation of body fat if energy intake is maintained at pre-injury levels.

There is no evidence to date to suggest that disability alters the nature or extent of obesity related to illnesses found in the general population.

Obesity in the disabled can be managed along similar lines to that in the normal population using a multicomponent approach emphasising education, motivation and reinforcement.

Unfortunately, research evidence of the benefits of different types and intensities of exercise appropriate for different handicaps is limited. This domain is receiving progressively more attention but is still an area of major development in exercise physiology.

Self-management of body composition should be a goal of everyone

Too many individuals rely on the motivation of others in attempts to maintain desirable lifestyle practices.

What opportunities are available in the self-monitoring of body fatness?

If more detailed analyses of body composition are required, individuals are encouraged to seek assistance from a qualified exercise scientist or other health professional.

'Naked' eye observations provide a clear indication of body size.

'Creeping' obesity with age should not be condoned.

Photographic records help to reduce subjectivity in self-assessment.

Somatotyping uses photography in the determination of physique type: fatness (endomorphism), muscularity (mesomorphism) and linearity (ectomorphism).

Height and weight are the two most widely used anthropometric measures.

Height and weight are good indicators of nutritional status, particularly during the growing years.

Accuracy and consistency in the measurement of height and weight and other anthropometric indicators is critical.

Body weight is influenced by numerous factors. Frequent (daily) weighing may be counterproductive.

Height-weight charts provide an indication of growth status but provide only a limited indication of body composition status.

Be wary of height-weight tables in popular magazines. Determination of frame size by most people involves an unacceptable level of subjectivity.

Accurate measurement of selected circumferences provides a very good overview of relative fatness and distribution of fat.

There are numerous tell-tale sites of subcutaneous fat storage. The pinch test is a useful indicator of fatness.

In summary

- (1) Every opportunity needs to be taken to replace the concept of weight with that of body composition, particularly in relation to fat and its distribution, to avoid misconceptions about physical activity and weight.
- (2) Physical activity is one of a number of factors determining body fatness. These factors may affect total body fatness in ways different to abdominal fatness (or its subcomponents like intra-abdominal fat). These include genetics, gender, food and psycho-sociocultural factors.
- (3) The measurement of physical activity itself, its contribution to overall energy expenditure; and the measure of body fatness in more direct, accurate and precise and accessible ways, are pressing issues for public health and for the health care professions.
- (4) There is a growing understanding of locomotion and spontaneous movement in the overall statement of energy expenditure, and how they may affect body fatness, and how they may be recruited for better health.
- (5) The consequences of obesity may be ameliorated by greater emphasis on physical activity; and offsets may be in evidence not only through fixed determinants like gender, but also by various preferred lifestyles.