CARBOHYDRATE NEWS

Providing the most current and practical scientific information on carbohydrate and its role in nutrition and health.

OBESITY, PHYSICAL ACTIVITY AND THE BUILT ENVIRONMENT

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The World Health Organization has identified obesity as one of the major public health problems for the twenty-first century.[1] In Canada, the prevalence of overweight and obesity in adults has increased dramatically during the past ten years, with almost half of the population now classified as being either overweight (33%) or obese (15%).[2] The prevalence has also increased among adolescents (11-16 years old), with 15% now estimated to be overweight and 5% obese.[3]

Weight gain and obesity occur when more food energy is ingested than is expended through normal bodily functions, physical activity, and for growth (e.g., children). It is estimated that physical activity accounts for 15-30% of total energy expenditure.[4] The amount of energy expended on physical activity is variable and can be altered by changing activity patterns.

Obesity is the result of energy imbalance over time likely from a combination of genetic and environmental factors that determine individual energy needs, voluntary food consumption, and activity patterns. There have been considerable advances in scientific understanding of the genetic contributions to obesity. However, because the prevalence of obesity is increasing at such a fast rate, genetics alone cannot explain the obesity epidemic. The recent rise in obesity is more likely related to changes in the environment that promote excess energy intake and minimize physical activity. For example, environmental factors that may promote excess energy intake include the abundance of food and food outlets and increasing reliance on foods prepared and eaten outside the home. The changing environment also limits physical activity choices as a result of sedentary occupations, technological innovations, passive leisure activities, automated transportation, etc.

Being physically active is an important part of staying healthy.[5] The report on Dietary Reference Intakes for macronutrients recommends that adults get at least one hour of moderate physical activity daily to maintain healthy weights.[6]

Physical activity includes both *structured activity*, such as exercise and sports; and *purposeful activity*, which can include house and yard work, or walking and biking to shop, work or school. While exercise and sports may require a certain level of skill, talent or motivation and financial support, *purposeful activity* is something that we do out of necessity and typically has few barriers.

The built environment can have a major impact on physical activity. The built environment can be defined as "the man-made elements of the physical environment; buildings, infrastructure, and other physical elements created or modified by people and the functional use, arrangement in space, and aesthetic qualities of these elements".[7] Components of the built environment that influence physical activity include availability of recreational facilities, parks, playgrounds, sidewalks, bike paths, routes for walking, and the safety of streets and neighbourhoods.

Engagement in *purposeful activity* such as walking or biking to work or to public transit has diminished over the past three decades. Much of this may be related to urban design in the latter part of the twentieth century where housing was separated into neighbourhoods without easy access to services such as shops, restaurants or entertainment. In their research on two US cities, Frank et al[8] demonstrated that the rates of overweight and obesity are lower for those living in urban environments with services and facilities within walking or biking distance. These communities have higher land-use mix than suburban areas that are predominantly housing tracts. They argue that life in the subdivisions necessitates reliance on the car because routes between homes and services are not walkable. This may be the result of streets that lack sidewalks or the design of cul de sacs that do not permit easy access from one street to another.[9]

> LAND-USE MIX IS DEFINED AS "THE RELATIVE PROXIMITY OF DIFFERENT LAND USES WITHIN A GIVEN AREA. A MIXED-USE NEIGHBOURHOOD WOULD INCLUDE NOT JUST HOMES BUT ALSO STORES, OFFICES, PARKS, AND PERHAPS OTHER LAND USES".[10]

Land-use mix appears to be a key environmental factor in the relationship between *purposeful activity* and body weight. Frank et al[8] have shown that the risk of obesity is reduced by 4.8% for each kilometre

walked per day and increased by 6% for each hour spent in a car. These relationships were unrelated to income or educational attainment. Nevertheless, it is unclear if the higher levels of physical activity in walkable environments are due to differences in the types of people who choose to live in these areas, or to the physical environment itself. People who choose to live in more urban environments may be willing to trade off floor space for a walkable, service dense environment and a shorter commute to work. These people may also differ in other ways such as socio-economic status, another factor that is predictive of body weight.

Promotion of physical activity through sport and recreation is one strategy to address the energy imbalance that leads to obesity. With that said, the only interventions that have succeeded are those that combine environmental policy to create space for physical activity with promotional programs to encourage their use.[11] However, interest is growing in matters related to the built environment and opportunities to enhance *purposeful activity* through better urban design. Changes to the built environment that encourage physical activity will require cooperation among local governments, private developers, and community groups. The current attention to the "obesity crisis" has raised interest among these professionals and may provide a step in the right direction (see www.activelivingbydesign.org).

REFERENCES

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2 Statistics Canada. Health Indicators Vol. 2004 No. 1. Ottawa: Statistics Canada, 2004.

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10 Handy, SL et al. Am J Prev Med 2002;23:64-73.

11 Kahn EB et al. Am J Prev Med 2002;22:73-107.

DIETARY REFERENCE INTAKES FOR PHYSICAL ACTIVITY

Dietary Reference Intakes (DRIs) are a set of nutrient recommendations for healthy Canadians and Americans, published by the US Institute of Medicine in collaboration with Health Canada. In addition to nutrient recommendations, the DRI report on macronutrients includes physical activity recommendations to decrease the risk of disease and maintain recommended body weight.[1] These recommendations will be considered by Health Canada in developing future guidance for Canadians. The present article is a summary of key recommendations and benefits of physical activity from the DRI report.

PHYSICAL ACTIVITY RECOMMENDATIONS

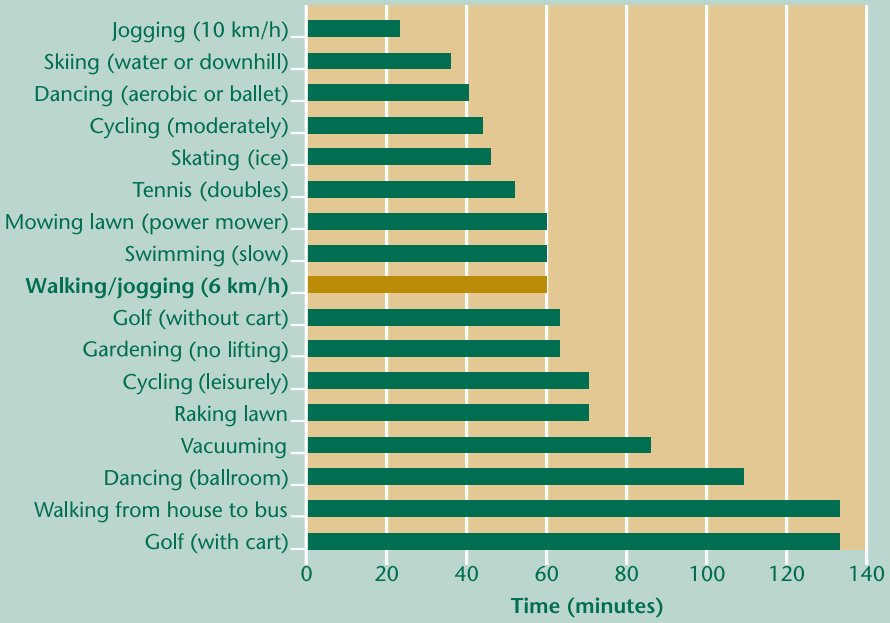
The report recommends 60 minutes of daily moderate intensity physical activity (e.g., walking/jogging at 6 to 8 km/h) to prevent weight gain as well as to accrue additional, weight-independent health benefits. This activity level is for both adults and children, corresponds to an "active" lifestyle and is in addition to the activities required by a sedentary lifestyle (i.e., activities required for independent living).

The report acknowledges that some benefits can be achieved with a minimum of 30 minutes of moderate intensity physical activity most days of the week; however this is considered insufficient to maintain body weight in adults in the recommended BMI range of 18.5 to 25 kg/m^2 and to achieve all the identified health benefits. The recommendation is greater than the 1996 US Surgeon General's Report but similar to that in Canada's Physical Activity Guide (www.phac-aspc.gc.ca/pau-uap/paguide/).

PHYSICAL ACTIVITY FOR AN ACTIVE LIFESTYLE

It is important to recognize that the activity recommendations in the report consider "accumulated" physical activity performed regularly (e.g., 4-7 days/ week) and involve both low intensity activities of daily life (e.g., taking the stairs at work) as well as more vigorous exercises (e.g., jogging and aerobics). Walking/jogging was chosen as the "reference activity" because it is the most significant physical activity in the daily lives of most individuals. A wide variety of other activities can achieve the same goal and must be evaluated in terms of "exertions equivalent to walking/jogging". The following chart provides an estimate of the duration of daily living and leisure activities equivalent to 60 minutes of walking.

Estimated Duration of Various Daily Activities Equivalent to 60 Minutes of Reference Activity (walking/jogging 6 km/h)



BENEFITS OF PHYSICAL ACTIVITY

In addition to the benefit of body weight control, the goal of one hour per day offers additional benefits of reducing the risks of chronic diseases, such as altering blood lipid profiles and decreasing body fat and/or increasing muscle mass. Some of the identified health benefits include:

- lower mortality rates
- reduced risk of obesity
- reduced risk of type 2 diabetes, reduced total and abdominal obesity, both of which are risk factors for type 2 diabetes
- lower coronary heart disease mortality
- increased serum high-density lipoprotein (HDL) cholesterol, decreased serum tryiacylglycerol, decreased blood pressure, enhanced glucose effectiveness and insulin sensitivity, decreased cardiac arrhythmias
- reduced risk of colon and breast cancer
- increased bone mass in children and adolescents; maintained bone mass in adults; improved muscle strength, coordination, and flexibility which may benefit elderly individuals by preventing falls and fractures
- favourable changes in anxiety, depression, stress reactivity, mood, self-esteem, and cognitive functioning.

REFERENCE

1 Institute of Medicine. Dietary Reference Intakes: Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids. Washington DC: National Academies Press, 2002.

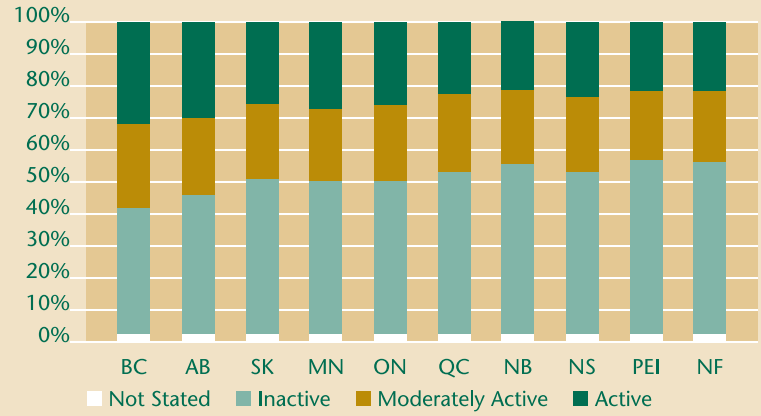
HOW ACTIVE ARE CANADIANS?

The 2003 Statistics Canada *Canadian Community Health Survey* (CCHS) provides information on leisure-time physical activity. These data show that almost half of Canadians 12 years of age and older (47%) are physically inactive, 24% are moderately active, and only 26% are physically active. Since most health benefits are associated with being physically active on a regular basis, these data suggest that 71% of Canadians are not physically active enough to achieve optimal health benefits. These data also show a trend towards lower levels of activity with increasing age, and that men are more active than women (see Table).

Age	Physically Active (%)
Total, 12 years and older	26.1
Males	29.8
Females	22.7
12-19	47.3
20-34	28.5
35-44	24.0
45-64	21.1
65 years and over	17.2

CCHS DEFINES PHYSICALLY INACTIVE AS EXPENDING LESS THAN 1.5 KCAL/KG BODY WEIGHT/DAY (EQUIVALENT TO ABOUT HALF-HOUR OF CUMULATIVE WALKING); MODERATELY ACTIVE AS 1.5–2.9 KCAL/KG/DAY; AND PHYSICALLY ACTIVE AS GREATER THAN 3.0 KCAL/KG/DAY (EQUIVALENT TO ABOUT ONE HOUR OF CUMULATIVE WALKING).

Leisure-time physical activity also varies by province, with the highest proportion of active people in British Columbia and the lowest in New Brunswick (see Figure). In addition, as education and income levels rise, the proportion of people who are active increases.



RESEARCH UPDATE: CARBOHYDRATE FOR SPORTS

Hargreaves M, Hawley JA, Jeukendrup A.
Pre-exercise carbohydrate and fat ingestion: effects on metabolism and performance
J Sports Sci 2004;22:31-8.

The role of dietary carbohydrate during training in the days leading up to competition and in the hours immediately before exercise was reviewed. The authors concluded that increasing dietary carbohydrate intake to ~10 g/kg body weight in the days before competition increases muscle glycogen stores and enhances exercise performance in endurance events lasting 90 minutes or more. Carbohydrate ingestion (~200-300 g) 2-4 hours before exercise increases liver and muscle glycogen and enhances subsequent endurance exercise performance. The effects of carbohydrate ingestion on blood glucose and free fatty acid concentrations and carbohydrate oxidation during exercise persist for at least 6 hours. All recent studies show either unchanged or enhanced endurance exercise performance after the ingestion of carbohydrate in the hour before exercise. Individual experience should inform the most practical and effective pre-exercise ingestion protocol. Increased fat availability before exercise reduces carbohydrate utilization during subsequent exercise, but there is no beneficial effect on performance.

Burke LM, Kiens B, Ivy JL.
Carbohydrate and fat for training and recovery
J Sports Sci 2004;22:15-30.

The purpose of this article was to propose revisions to 1991 guidelines for carbohydrate needs for athletes during training and recovery. Athletes should achieve carbohydrate intakes to meet the fuel requirements of their training programme and to optimize restoration of muscle glycogen stores between workouts. It is valuable to choose nutrient-rich foods including protein, which may promote additional glycogen recovery when carbohydrate intake is suboptimal. When the period between exercise sessions is <8 hours, carbohydrate intake should begin as soon as practical after the first workout. There may be advantages in meeting carbohydrate intake targets as a series of snacks during the early recovery phase, but during longer recovery periods (24 hours) the pattern and timing of carbohydrate-rich meals and snacks should be according to what is practical and comfortable for the individual. Carbohydrate-rich foods with a moderate to high glycaemic index provide a readily available source of carbohydrate for muscle glycogen synthesis, and should be the major carbohydrate choices in recovery meals. There is no evidence that diets which are high in fat and restricted in carbohydrate enhance training.

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