Benefits of Physical Activity

Physical activity such as aerobics, cardiovascular workouts and weight training reduces the risk of cardiovascular disease (CVD), diabetes, osteoporosis, and some types of cancer. These diseases cost the provincial government a significant portion of its health budget each year. Physical activity also helps maintain a healthy weight, relieves the painful symptoms of arthritis, and has a positive effect on mental health.

The benefits do not stop there. Exercise works in ways both subtle and powerful to improve general health and well-being. The positive physiological effects of exercise spill over into attitude, behavior, learning, and work performance.

A) Disease Prevention

Physical activity plays a preventive or treatment role in CVD, cancer, diabetes, osteoarthritis, osteoporosis, obesity, and mental health disorders. In addition to the staggering human cost of these conditions, their cost to the provincial government runs into billions of dollars annually.

1. Cardiovascular Disease

Key Facts

- CVD remains the leading cause of death in the province
- More than 9,000 lives are lost to CVD in British Columbia each year
- Physical inactivity is a major independent risk factor for CVD
- Direct CVD costs are over $7 billion annually

Physical inactivity is now officially recognized as an independent major risk factor for cardiovascular disease - comparable to smoking, high blood pressure, and high cholesterol. This designation has been bestowed by a number of important organizations, including the International Federation and Society for Cardiology, the World Health Organization, the American Heart Association, and the Heart and Stroke Foundation of Canada.

This risk-factor designation is not given lightly. It results from a body of careful research conducted over the last four decades. Studies have examined occupational and leisure-time physical activity, and they have used both activity levels and cardiovascular fitness as measures when establishing the role of physical activity in disease prevention.

Thirty-six studies examining the relationship of physical activity level to the risk of coronary (or ischemic) heart disease (CHD) have been published since 1953. In addition, at least seven significant studies have been done comparing cardio-respiratory fitness and risk of CHD. These studies - population-based studies involving large numbers of subjects with follow-up ranging from 4 to 25 years - provide significant evidence.

Reviews of the epidemiologic literature summarizing all of these studies conclude that physical activity is strongly and inversely related to CHD risk. (1,2) In short, physically active people have a substantially lower overall risk for major coronary events. The most active individuals consistently show one-half the risk of CHD when compared with their least active peers. (3)

Studies similar in design to those examining CHD have looked at physical activity and strokes, or cerebrovascular accidents. Thirteen population-based studies have been documented to date, with the great majority of them showing an inverse relationship between physical activity and stroke. (4)

Physical activity also plays a part in secondary prevention. High blood pressure (a major risk factor in itself for CHD), for example, is moderated by regular physical activity. In studies of older women, the most active participants had a 30% reduced risk of developing hypertension. (5) Similar results have been shown with other age groups and with men. (6) All together, the studies show that physical activity is associated with a decreased risk of later developing hypertension among both men and women. (7)

Although vigorous physical activity such as aerobics, cardiovascular workouts and weight training offers the greatest protection from CVD, people shifting from a very inactive lifestyle will receive modest health benefits from adding as little as 500 kcal/week of energy expenditure - the equivalent of 15 minutes a day of brisk walking, active yard work, or gardening. The health benefits rise steadily as activity is increased beyond this base level to the recommended level of 1,000 kcal/week. This is clearly within reach of the least active and least motivated individuals.

This information has enormous implications for British Columbia, given that CVD is the number one cause of death in the province. (8) It takes its toll in the form of CHD, cerebrovascular diseases, cardiac dysrthythmias, atherosclerosis, and hypertensive diseases.

The incidence of CVD increases dramatically with age. In the following age groups, it accounts for a significant percentage of all deaths: ages 25 to 44 - 13.5%; ages 45 to 64 - 33%; and age 65 and over - 48%. (9)

Premature death from CVD (death before age 70) is the leading cause of potential life lost. In 1995, the potential years of life lost in British Columbia for coronary heart disease alone was 17,037 (on average, 10.6 years per victim). Potential years of life lost due to stroke was 5,664 (9.8 years per victim). (10)

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2. Cancer

Key Facts

- Colon cancer claims more than 600 lives in British Columbia each year. Physical activity can reduce the risk of this disease by as much as 50%.
- Breast cancer is the fifth leading cause of death in women in the province, claiming over 500 lives annually. Physical activity during adolescence and young adulthood may protect against later development of breast cancer.

The role of physical activity in the prevention of colon cancer is well established. Of 29 reported studies (11), 18 considered the role of occupational physical activity. Fourteen of the 18 show a statistically significant inverse relationship between estimated occupational physical activity and the risk of colon cancer. Of 11 studies considering leisure-time or total physical activity, 8 show the same inverse relationship, with results consistent for men and women.

The sum of the research in this area confirms an association between physical activity and decreased risk of colon cancer, with increasing amounts of physical activity conferring greater degrees of protection. (12) Studies have reported that physical activity reduces the risk by as much as 50%. (13)

With regard to breast cancer, half of the reported studies looking at occupational physical activity show a significant inverse relationship between breast cancer and physical activity. (14,15) Epidemiological studies of leisure-time or total physical activity give mixed results.

A number of studies cited by the U.S. Surgeon General in *Physical Activity and Health* (16) examined the possibility that physical activity during adolescence and young adulthood may protect against later development of breast cancer. While more research is necessary, information to date lends support to the disease-prevention role of physical activity.

The connection between physical inactivity and breast and colon cancers has obvious relevance for action in British Columbia. Breast cancer is the fifth leading cause of death in women in the province, claiming over 500 lives each year. In 1995, the potential years of life lost due to breast cancer was 5,838 (15.8 years per victim). Women in British Columbia have a lifetime probability of developing breast cancer of greater than 1 in 10. Their probability of dying of breast cancer is 1 in 25. (17)

More than 600 people lose their lives to colon cancer each year. In 1995, the potential years of life lost due to the disease was 3,648 (11.0 years per victim). Male British Columbians have a greater than 1 in 20 chance of developing colon cancer and a 1 in 40 chance of dying from it. (18)

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3. Diabetes

Key Facts

- Three percent of British Columbians over the age of 11 - more than 88,000 people - have been diagnosed with diabetes.
- Physical activity reduces the risk of developing non-insulin-dependent diabetes mellitus by as much as one-half and helps to control mild cases of it.

Physical activity reduces the risk of developing non-insulin-dependent diabetes mellitus (NIDDM) and helps to control mild cases of it. A wide variety of studies support this fact. (19)

Case-control studies have shown physical inactivity to be significantly associated with NIDDM. (20,21) Research involving older women showed that those who have high levels of physical activity are only half as likely to develop this type of diabetes as those with low levels of physical activity. Moderately active women have an intermediate risk. (22)

Prospective studies have also demonstrated that physical activity protects against the development of NIDDM. (23) This is particularly true in men at high risk of developing diabetes (i.e., the obese and those with high blood pressure or a parental history of the disease). Each 500 kcal of additional weekly physical activity is associated with a 6% decrease in risk. (24)

In British Columbia, 3% of the population over the age of 11 - some 88,000 people - have been diagnosed with diabetes by a health professional. The prevalence of diabetes increases with age: it is 8% in the 65 and older group. NIDDM, the most common type of diabetes, usually occurs in people over the age of 40. (25)

Furthermore, the prevalence of insulin resistance in *non-diabetic* inactive individuals (some 25% of adults) is such that the improvement in insulin sensitivity that results from regular physical activity may reduce the risk of NIDDM in a significant portion of the population. (26) This has important implications since diabetes is a complicating factor in CHD, stroke, peripheral vascular disease, and congestive heart failure. (27)

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4. Osteoarthritis

Key Facts

- Some 230,000 women and 116,000 men in British Columbia over the age of 25 suffer from arthritis.
- Regular, moderate physical activity improves function and relieves symptoms among people with osteoarthritis (and rheumatoid arthritis).

Osteoarthritis is characterized by degeneration of cartilage and by new growth of bone around the joint. It is not known if an active lifestyle plays a part in protection against the development of osteoarthritis. However, regular moderate physical activity improves function and relieves symptoms among people with osteoarthritis (and rheumatoid arthritis). (28,29,30)

Physical activity results in significant reduction in joint swelling in individuals with arthritis (31), raises pain threshold, and improves energy level (32,33), psychosocial status, functional status, and physical fitness. (34,35)

Although arthritis is uncommon as a cause of death, it is the most frequent cause of physical disability, particularly in women. In British Columbia, approximately 20% of women (230,000) and 10% of men (116,000) over the age of 25 suffer from arthritis. Nearly half of women over age 75 and over 40% of men are affected. (36)

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5. Osteoporosis

Key Facts

- In British Columbia, 25% of women over age 50 and 50% of those over age 70 will develop osteoporosis.
- Twenty percent of those who survive an osteoporotic hip fracture require long-term care in a nursing home.
- One-half of osteoporosis cases are preventable.

Osteoporosis, characterized by decreased bone mass and deterioration of the bone tissue, makes the bones more fragile and susceptible to fracture. Since bone mass and strength decrease gradually with age, osteoporosis primarily affects older individuals, particularly women.

The presence of osteoporosis and the age at which it appears depend on three variables: the level of peak bone mineral mass attained in early adulthood, the age at which bone mineral loss begins, and the rate of bone mineral loss. (37)

Physical activity plays a substantial role in the development of peak bone mass during childhood and adolescence and in the maintenance of skeletal mass as a young adult. (38) This has been shown in studies comparing bone mineral density in athletic and inactive young adults (39) and in studies looking at the physical activity levels of university students. (40)

Of particular interest is the role of physical activity in preventing or slowing the bone loss that begins to occur in women after menopause. Studies of postmenopausal women have shown bone mineral density is correlated to muscle strength, cardio-respiratory fitness, and physical activity. (41) Indeed, cross-sectional studies of women (and men) less than 50 years of age show 8% (and 10%) higher vertebral bone mineral density in active individuals than in their inactive peers. (42)

Older people are particularly susceptible to problems. Vertebral fractures, for example, can occur spontaneously or with minimal trauma. Regular physical activity, by helping to maintain the strength of bone and supporting muscles, can significantly reduce the risk of falls and fractures in this age group.

In British Columbia, one in four women over age 50 will develop osteoporosis. One in two women over 70 will develop it. At age 55, the hospitalization rate for falls begins to increase in women, such that it is double the rate for men by age 75. (43) About one in five Canadians who survive an osteoporotic hip fracture requires long-term care in a nursing home. More than 50% of them will be disabled, many permanently. (44)

A 10-year study examining the incidence of fracture of the femur (an important indicator of the prevalence of osteoporosis) shows that these fractures are occurring at an increasing rate. (45) This fact, in combination with a steadily aging population, ensures that osteoporosis will remain a pressing health issue requiring effective preventive measures. Proper action will pay off as it is estimated that fully half of osteoporosis cases are preventable with a combination of lifestyle, diet, and therapeutic approaches. (46)

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6. Obesity

Key Facts

- In British Columbia, 26% of all adults are overweight. This is highest in ages 45 to 64, with 36% overweight.
- The prevalence of obesity in children and youth has gone up nearly 50% in the last 15 years.
- Physical activity has an important mediating effect on obesity.
- Physical activity affects body composition and weight favorably by promoting fat loss while preserving or increasing lean mass.

Obesity increases the risk of high blood pressure, coronary heart disease, osteoarthritis, orthopedic problems, various cancers, and all-cause mortality. It also plays a central role in the development of diabetes. (47) Social, emotional, and psychological problems are also correlated with obesity in a society that often equates excess fat with being lazy or unattractive.

Physical activity has an important mediating effect on obesity. Cross-sectional studies report lower weight, body mass index, or skin fold measures in people with higher levels of self-reported physical activity or fitness. (48,49) Research has shown physical activity to be inversely related to the risk of becoming overweight. (50)

Comprehensive review articles (51,52) conclude that physical activity affects body composition and weight favorably by promoting fat loss while preserving or increasing lean mass. The rate of weight loss is positively related to the frequency and duration of activity sessions and the length of time over which a physically active lifestyle is maintained. Although dietary habits are important, weight-loss maintenance is rarely successful in the absence of regular physical activity. (53)

In British Columbia, 26% of all adults (36% of those in the 45 to 64 age group) are overweight and, thus, at an increased risk of coronary heart disease, diabetes, and other debilitating conditions. (54)

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7. Mental Health Disorders

Key Facts

- In British Columbia, annual hospital admissions due to mental health disorders are in the range of 25,000.
- Physical activity is associated with fewer symptoms of anxiety and depression.
- Physical activity may help improve mental health and even prevent some mental disorders by improving self-confidence, self-concept, and other psychological variables.

Physical activity has proven beneficial for individuals in the general population who report mood disturbance, including symptoms of anxiety (55) and depression (56), as well as in patients who have been diagnosed with depression (57).

Four large population studies - two in Canada, each involving more than 20,000 subjects, and two in the United States - all found that physical activity is associated with fewer symptoms of anxiety and depression. (58) The association was strongest in women and in individuals 40 years of age and older.

Physical activity may help improve mental health and even prevent some mental disorders by improving self-confidence, self-concept, and other psychological variables. (59) Improvements can come from regular moderate physical activity, even in the absence of improved cardio-respiratory fitness.

There are about 25,000 annual hospital admissions in British Columbia due to mental health disorders, with most stays being for lengthy periods of time. (60) Many more people suffer mild disorders, such as anxiety and depression, which may not require hospitalization but which do increase the use of general practitioner, psychiatric, and community health services.

B) Health Enhancement

Besides reducing the risk of disease, physical activity has an influence on a number of psychological and social factors that are determinants of health.

1. Psychological Well-Being

Key Facts

- Regular physical activity improves self-concept, self-esteem, and self-efficacy.
- Regular physical activity is associated with improved mood, greater confidence, and better social skills.

- Regular physical activity is a proven antidote to stress.

In addition to alleviating the symptoms of anxiety and depression, physical activity contributes to psychological well-being in other important ways.

The research consistently shows that physical activity improves self-concept, self-esteem, and self-efficacy (i.e., the belief that one can successfully bring about desired changes in one's own behavior). (61) Physical activity is also associated with improved mood, greater confidence (at least in children and youth), and better social skills (at least in individuals with a mental disability). (62)

Physical activity may also alter some aspects of the stress response and coronary-prone (Type A) behavior. (63) Physical activity is a proven antidote to stress and beneficial effects persist longer after a session than they do for other techniques such as relaxation or quiet rest. (64) Individuals with the most stressful lives gain the greatest benefits from physical activity. (65)

One summary of the research (66) proposed a range of psychological benefits of physical activity in addition to those mentioned above. Included on the list are increases in emotional stability, independence, sense of control, and a positive body image, as well as decreases in confusion, hostility, and anger.

Constant anxiety, stress, and uncertainty are facts of life for many British Columbians. This may be particularly true for individuals with little education, those living on low incomes, and single parents. Regular physical activity can make a special contribution to the health and well-being of these groups.

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2. Physical Health and Quality of Life

Key Facts

- Regular physical activity reduces the risk of low-back pain and injury.
- Regular physical activity improves fitness and reduces the risk of falls in older people.
- Regular physical activity contributes to the comfort and mobility of individuals with a physical disability.
- As much as one-half of the physical decline typical between the ages of 30 and 70 is due not to aging itself but to an inactive way of life.

Physical activity has numerous beneficial physiological effects. Most widely appreciated are its effects on the cardiovascular and musculoskeletal systems, but benefits on the functioning of the metabolic, endocrine, and immune systems are also considerable. (67)

Adequate levels of cardiovascular fitness, strength, and flexibility allow daily tasks to be accomplished with ease and comfort and with less fatigue. The effects of this are particularly noticeable in people whose physical function is compromised by chronic conditions such as heart disease or arthritis. Studies show these groups experience improved daily function from increases in physical activity. (68,69)

Individuals with physical disabilities can benefit from physical activity in special ways. Improved posture resulting from exercise training helps reduce the aches and pains that can accompany long periods of sitting. Better circulation reduces the possibility of blood-pooling and swelling in the legs. And maintenance of a healthy weight helps those who use wheelchairs (or other mobility aids) to transfer and get around with less effort, making them more mobile. (70)

Back pain and injury also respond to regular physical activity. Studies support the role of posture, strength, flexibility, and general aerobic fitness in both the prevention and rehabilitation of back problems. (71) Research on firefighters has demonstrated a significantly lower frequency of back injuries in the most fit group compared to the least fit. (72) Additional research has shown a strong relationship between the three combined factors of obesity, smoking, and decreased physical activity and the occurrence of low-back pain in individuals with physically demanding jobs. (73)

Gradual functional decline used to be taken for granted as a natural part of the aging process. Research, however, now suggests that as much as one-half of the decline between the ages of 30 and 70 is due not to aging itself but to an inactive way of life. Regular physical activity in older adults not only alleviates the decline in cardio-respiratory fitness typical in inactive people but can induce a functional gain equivalent to as much as 10 to 15 years of aging. (74)

Physical activity helps older adults maintain strength and flexibility as well as balance, coordination, and agility. (75) These all help reduce the risk of falling, a real worry for many older people since falls are a major contributor to reduced mobility and loss of independence - and a significant cost to the health care system.

The benefits of regular physical activity for all British Columbians are obvious. They take on particular significance for older adults as a public health issue - and a health care cost issue - when we realize that the portion of the provincial population 65 years of age and older is projected to increase by almost 40% (from 12.6% to 17.3% of the total population) in the next 25 years. (76)

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3. Behavior, Learning, and Work Performance

Key Facts

- Regular physical activity increases morale, mental performance, and productivity in working adults.

The beneficial effects of regular activity on both physical health and psychological well-being spill over into other areas. Three of these are behavior, learning, and work performance.

Positive results have been shown in the workplace setting. Participants in fitness programs typically report improvement in energy levels, job attitude, work performance and overall morale - all factors critical in enhancing productivity. (77)

A Swedish study found that mental performance following exercise was significantly better in individuals who are physically fit. Fit employees made 60% fewer errors on tasks involving concentration and short-term memory as compared to unfit employees. (78) Productivity gains of 3% (over controls) have been reported in one Canadian study. (79)