

Inactivity: A Bad 'Habit' Costing Our Productive Lifestyle

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Abstract

Rates of physical inactivity continue to rise in North America and throughout the world. Preventable health related illnesses associated with inactivity and the financial costs associated with treating these illnesses should be of concern. Many individuals believe they are active and achieve the present recommendation of 150 minutes of activity per week. However, many do not recognize that in achieving the present activity standard, there are between 12.25 to 14.25 waking hours of light-intensity activity or inactivity. Further, most people do not realize that being inactive significantly increases the risk of coronary artery disease, stroke, hypertension, colon cancer, breast cancer (in women only), type 2 diabetes, and osteoporosis. Perhaps most importantly, people need to understand the meaning of a sedentary lifestyle and how this will impact on their independent way of life, especially after the retirement age.

Keywords: Health risks; Independence and inactivity

Physical inactivity has become a public health issue in Canada and globally [1,2], which has led to cardiovascular/coronary artery disease (CVD/CAD) becoming the most common and expensive medical condition affecting the work force [3]. Based on recent data, 85% of Canadian adults do not meet Canada's physical activity guidelines of 150 min/week of moderate-to-vigorous physical activity [4]. Data from the late 1990 estimated 19% of the coronary artery disease cases in Canadian men were directly due to physical inactivity [5], 53% of the Canadian population was inactive [6], resulting in an estimated financial burden (from both genders) of approximately \$5.0 billion (2.6% of all health/medical care costs) on the health care system and economy [5]. By 2009, the total health care costs in Canada of physical inactivity escalated to \$6.8 billion (3.8% of all Canadian health/medical care costs); \$2.4 billion in direct costs and \$4.3 billion indirect costs [7]. According to Janssen [7], "Direct costs refer to the value of goods and services for which payment was made and resources used in treatment, care, and rehabilitation related to illness or injury (hospital care expenditures, drug expenditures, physician care expenditures, expenditures for care in other institutions, and additional direct health expenditures). Indirect costs refer to the value of economic out-put lost because of illness, injury-related work disability, or premature death." Obesity, inactivity and related healthcare costs for Australia, New Zealand, United Kingdom, and the USA are presented in table 1.

Most people consider health/medical care being related to diseases and thus do not consider the deferential effects of being inactive. Also, many people consider being inactive only leads to weight gain/being overweight. However, researchers have continually stated that many diseases are a result of the inactive lifestyle/behaviours [3-5,7,8]. Further, seven chronic diseases have been consistently associated with being inactive. These chronic diseases include, (1) coronary artery disease, (2) stroke, (3) hypertension, (4) colon cancer, (5) breast cancer (in women only), (6) type 2 diabetes, and (7) osteoporosis [5], while Janssen [7], went further and stated that the relative risk increased between 21% (breast cancer) and 74% (type 2 diabetes) in physically inactive adults when compared to active adults. In addition, the same authors stated that the "population attributable risk" (defined by the respective authors as, population at risk of the respective chronic illnesses as a result of an inactive lifestyle) ranged between 23.0% for hypertension and 38.0% for type 2 diabetes within Canadian men, and between 15.3% for breast cancer and 39.0% for type 2 diabetes within Canadian women (Table 2) [7]. It should be noted from table 2, women have a higher "attributable risk" for all seven chronic diseases.

Many individuals may consider themselves to lead an 'active' lifestyle by meeting the present recommended 150 minutes (approximately 21

minutes per/day) of weekly exercise. However, researchers suggest that an 'active' individual might engage in 30 minutes each day of brisk physical activity, walking or jogging (and in doing so meet current health guidelines on physical activity, 150 minutes/week), but this still leaves some 12.25 to 14.25 waking hours allocated to sitting/standing and light-intensity ambulatory activities [9,10]. Dunstan et al. [8], presented a adult sedentary behaviour daily activity 'model' which illustrates the daily schedules of most 'active'/working individuals (Table 3). Inactive or sedentary lifestyle (defined as, "A distinct class of behaviours (e.g., sitting, watching TV, driving) characterized by little physical movement and low energy expenditure") has a direct negative influence on metabolism, bone mineral content and cardiovascular health (Table 4) [11]. In addition to these three health concerns, epidemiological evidence has linked sedentary lifestyle to increased health risk of cancer, metabolic health, obesity, and psychosocial problems (Table 5).

Understanding the definition of a sedentary lifestyle as well as the relationships between sedentary lifestyle and health outcomes is crucial in changing our behaviour to lead a healthy independent way of life, especially after the retirement age and beyond. Some may argue that the determinants of inactive behaviour need to be addressed before implementation of any strategies involving an active lifestyle. However, over the past 25-30 years, we have shifted from an active and healthy to a sedentary and unhealthy lifestyle due to various changes in society; one example being, not walking to the supermarket located only three or four blocks away. A large part of this societal shift could be the result of availability of technology (facsimiles, mobile phones, electronic mail, and the automobile), which was supposed to assist with increasing a person's leisure/activity time, but has resulted in the opposite, and we are now spending more time being inactive/sitting. As such, one must consider the decrease in an active lifestyle being associated with a huge increase in the incidences of various health concerns listed above. This is especially true, when one considers that between 2007 and 2009 in Canada, only 15% of adults were getting the recommended 150 minutes

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Country	Obesity levels (%)*[12-14]	Inactivity levels (%)	Economic Costs converted to US\$
Australia	24.6	72.4† [15]	\$60 billion†† [16]
New Zealand	26.5	32.0‡ [17]	\$113 [18]-830 [19] million‡‡
United Kingdom	23.0-26.1	34.0¶ [20,21]	\$757 million [22]-\$11.1 billion [23,24]¶¶
United States	33.8-35.7	51.2 [25]-66.5 [26,27]	\$78.5 [28]-\$147 [29] billion***

Adult defined as age 16+, except otherwise listed

Obesity rates are defined as the percentage of the population with a Body Mass Index (BMI) over 30.

*2009 objectively measured data, based on health examinations.

†2006-2007 self reported data. Perform no activity or less than 2.5 hours per week of physical activity.

‡2006-2007 data self reported data. Age = 18+ year. 72.4% reported as being sedentary or engaging in inadequate (low frequency, intensity and duration) of exercise.

¶2008 self reported data. Percentage of individuals not reaching Government recommendations of 30 minutes of physical activity on at least five days a week for adults.

**2007 and 2008 self-reported data. Defined as "Insufficient physical activity": performing >10 minutes total per week of moderate or vigorous-intensity lifestyle activities (i.e., household, transportation, or leisure-time activity), but less than the recommended level of activity and "Inactivity": performing <10 minutes total per week of moderate or vigorous-intensity lifestyle activities (i.e., household, transportation, or leisure-time activity). "Recommended physical activity": can include moderate-intensity activities in a usual week (i.e., brisk walking, bicycling, vacuuming, gardening, or anything else that causes small increases in breathing or heart rate) for greater than or equal to 30 minutes per day, greater than or equal to 5 days per week; or vigorous-intensity activities in a usual week (i.e., running, aerobics, heavy yard work, or anything else that causes large increases in breathing or heart rate) for greater than or equal to 20 minutes per day, greater than or equal to 3 days per week or both.

††2008 estimate of Australian\$58 billion for health system and loss of productivity, and careers' costs.

‡‡1991 estimate of NZ\$135 million for health care costs attributable to obesity for the six conditions (non-insulin dependent diabetes, coronary heart disease, hypertension, gallstone disease, post-menopausal breast cancer and colon cancer) [18] and 2006 estimates of NZ\$784 to NZ\$911million for costs of health care and lost productivity attributable to overweight and obesity [19].

¶¶1998 estimate available for only England: £479.3 million [22] and 2007 estimate of £11.1 billion [23,24] for treating overweight and obesity, and related morbidity.

***1998 [28] and 2009 [29] estimate for direct costs related to overweight and obesity.

Table 1: Adult Population (sum of both genders) Considered Obese, Inactive, and Related Economic Costs.

	Coronary artery disease	Stroke	Hypertension	Colon cancer	Breast cancer	Type 2 diabetes	Osteoporosis
Men	26.6	24.9	23.0	23.5	NA	38.0	32.1
Women	27.1	25.7	23.7	24.2	15.3	39.0	33.0

Table 2: Physical Inactivity and estimates for population attributable risk (%) for Canadian Men and Women 2009 [7].

7:00AM AWAKE	8:00AM	9:00AM	5:00PM	7:00PM	11:00PM
Brisk walk (30 mins)	Breakfast (15 mins)	Work on computer (3.5 hours)	Commute from work (45 mins)	Watch TV (2-4 hours)	
	Commute to work (45 mins)	Lunch (30 mins)	Dinner (30 mins)		
		Work on computer (4.0 hours)			
					SLEEP
Exercise 0.5 hours		Inactive/Sitting 12.25 to 14.25 hours			
		House chores /Work tasks hours unaccounted			

mins = minutes

Table 3: Sedentary behaviour daily activity 'model' over a typical adult waking hours. Modified from Dunstan et al. [8].

Factor(s) & Author(s)	Sedentary Activity(ies)/Subjects	Effect(s)/Test(s) Outcome
Metabolic Dysfunction		
Humburg et al. [30]	5 days of complete bed rest in 22 volunteers who remained in bed for 23.5 hours/day	*No change in body weight *Significant ↑ total cholesterol, plasma triglycerides, glucose, and insulin resistance
Yanagibori et al. [31] and Bauman and Spungen [32]	20 days of bed rest	*Significant ↑ in plasma triglycerides *Significant ↓ HDL (good) cholesterol levels *↑ risk of cardiovascular disease
Bone Health		
Garland et al. [33], Caillot-Augusseau et al. [34], Morey-Holton and Globus [35], Zerwekh et al. [36] and Kim et al. [37]	(1) Humans and animals spending long periods of time in space (2) Spinal cord injured patients (3) Long-term bed rest	*Significant ↓ in bone mass *↓ in bone mineral density of 1% to 4% in the (1) lumbar spine, (2) femoral neck, and (3) greater trochanter in healthy subjects following 12 weeks of bed rest
Sedentary lifestyle leads to a reduction in bone mass, which is a result in an imbalance between bone resorption and deposition.		
Cardiovascular Health		
Purdy et al. [38], Bleeker et al. [39], Demiot et al. [40], and Hamburg et al. [30]	*5 days of bed rest of 20 healthy individuals *56 days of bed rest of head-down position (Women and International Space Simulation for Exploration Program [WISE]) of health women	*Peripheral vascular function (reactive hyperemia) resulted in (1) ↓ by 20% in the legs and (2) ↓ by 30% in the arms *Significant ↑ blood pressure and significant ↓ in brachial (arm) artery diameter *↓vasodilatation (endothelium-dependant) and ↑ endothelial cell damage *All detrimental changes in vascular function were reversed by aerobic and resistance training.
Inactivity seems to have a direct negative influence on vascular health.		

↑ = increase; ↓ = decrease; HDL = High density lipoprotein; LPL = Lipoprotein lipase

Table 4: Effect of inactive/sedentary lifestyle on health body physiology.

Factor(s) & Author(s)	Subjects & Investigation	Outcome
Cancer		
Howard et al. [41] and Gierach et al. [42] Other risks for women Patel et al. [43] and Wijndaele [44]	National Institute of Health-American Association of Retired Persons Diet and Health Study *488,720 men and women aged 50-71 years at baseline *1995-1995	*High levels of TV and/or video watching = ↑ risk of: (1) Colon cancer in men (2) Endometrial cancer in women *↑ risk of ovarian cancer *↑ percent breast density *↑ risk of colorectal cancer
Metabolic Health		
Hu et al. [45]	Nurses' Health Study *50,277 women not obese at baseline followed for 6-years *Analysis adjusted for lifestyle factors, including (1) diet and (2) physical activity	*↑ of 2 h/day in: (1) TV viewing = 14% ↑ in (2) sitting at work = 7% ↑ in type 2 diabetes
Hu et al. [46]	Health Professional's Follow-up Study (HPPS) *37,918 men	*↑ of 2 h/day in TV viewing = 20% ↑ for type 2 diabetes
Healy et al. [10] and Healy et al. [47]	Australian Study *Measured sedentary time, physical activity, and metabolic risk	*↑ levels of sedentary time = ↑ in: (1) Waist circumference (2) Triglycerides (3) 2h plasma glucose
Obesity		
Hu et al. [45]	Nurses' Health Study as per above	*↑ of 2 h/day in: (1) TV viewing = 23% ↑ed (2) sitting at work = 5% ↑ed risk of obesity
Brown et al. [48]	Australian Study *5-year study on determinants of gaining >5kg weight related to sitting duration	*Significant higher risk of gaining ≥5kgs when sitting time was ≥8 h/day compared to sitting < 3 h/day
Psychosocial Health		
Sanchez-Villegas et al. [49]	Spanish University Study	*31% ↑ed risk of a mental disorder in subjects spending > 42h/week watching TV compared to those watching TV <10.5h/week
McKercher et al. [50]	Epidemiological study	*Women accumulating ≥7,500 steps/day had 50% lower prevalence of depression when compared to women accumulating <5000 steps/day

↑ = increase; ↓ = decrease; h = hours; kg = kilograms

Table 5: Epidemiological evidence on the health risks association with a sedentary lifestyle.

(approximately 21 minutes/day) of weekly exercise, while the country's youth were still more sedentary, with only 9% achieving the minimum amount of activity.

We work most of our lives so that we can enjoy our 'golden years'. However, it is becoming more evident that the 'golden years' will be spent taking care of our various health concerns and/or taking prescription medication(s) because we were not active during our working years; perhaps bluntly stated, not moving our bodies as they seem to be designed for.

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