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### **Physical Inactivity - The Consequences of Being a Couch Potato By James L. Holly, MD**

Question: Which will do more for the improvement of your health? Visiting the doctor or visiting the gym?

Question: Which will do more for the improvement of your health? Taking a pill or taking a walk?

Question: What can medicines do to help you avoid the consequences of your inactive lifestyle? The answer: nothing!

There is now unequivocal evidence supporting the notion that all environmental factors combined, including physical inactivity (defined here as the activity equivalent of <30 min of brisk walking/day), account for the majority of chronic health conditions.

The Harvard Center for Cancer Prevention in a 1996 report estimated that, of the total number of cancer deaths, 30% were due to tobacco, 30% to adult diet and obesity, 5% to occupational factors, and 2% to environmental pollution. This report predated much of the work regarding exercise's preventive effect on many site-specific cancers.

A total of 91% of the cases of Type 2 diabetes and 82% of the coronary artery disease cases in 84,000 female nurses could be attributed to habits and so-called high-risk behavior. High-risk behavior was defined by the study as:

- body mass index (BMI) >25 (slightly overweight, normal BMI is 19 to 24)
- diet low in cereal fiber and polyunsaturated fat

- high in transfat (see May 6, 2003 Examiner, “Eating for your Health -- Trans Fats What are They and Why are They Dangerous?”) and glycemic load (see July 17, 2003 Examiner, “Beyond the Glycemic Index: The Glycemic Load”)
- a sedentary lifestyle,
- currently smoking.

The majority of deaths from chronic health conditions in the United States are of environmental origin. Physical inactivity is the third leading cause of death in the United States and contributes to the second leading cause (obesity), accounting for at least 1 in 10 deaths.

Studies showed that 30-50% of all cases of Type 2 diabetes, coronary heart disease, and many cancers were prevented by 30 min of moderate-intensity exercise each day in middle-aged women (e.g., walking >3 miles/h) compared with others who exhibited lower levels of physical activity.

The question arises: how does an environmental factor such as physical inactivity induce susceptibility to such detrimental health conditions? Modern men and women are still designed for a pre-agricultural hunter-gatherer lifestyle. Hunter-gatherer societies had to undertake moderate physical activity for more than 30 min each day to provide basic necessities, such as food, water, shelter, materials for warmth, and so forth, to survive. One can speculate that any physical attribute which prevented a hunter-gatherer from engaging in physical activity would increase the likelihood of that person not surviving.

Humans were not designed for an inactive lifestyle. The often-perceived notion that being sedentary has no adverse clinical effect has no biological basis to it and hence is false. Humans have an intrinsic biological requirement for a certain threshold of physical activity. A sedentary lifestyle disrupts the normal body functions which are needed to maintain good health. This change in behavior from active to inactive lifestyle could ultimately lead to the chronic metabolic syndrome manifested as syndrome X. Thus the most important preventative health action a man or woman could take is to eliminate inactivity as an environmental influence in their lives.

### Inactivity and Heart Disease

The Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults concluded on evidence-based medicine:

“Physical inactivity is...a major, underlying risk factor for coronary artery disease. It augments the lipid and non-lipid risk factors of the metabolic syndrome. It further may enhance risk by impairing cardiovascular fitness and coronary blood flow. Regular

physical activity reduces very low-density lipoprotein levels, raises HDL cholesterol, and in some persons, lowers LDL levels. It also can lower blood pressure, reduce insulin resistance, and favorably influence cardiovascular function. Thus, ATP III recommends that regular physical activity become a routine component in management of high serum cholesterol.”

Cardiovascular disease was the primary cause of 949,619 deaths (41% of all deaths) in the United States in 1998. Inactivity contributed to these deaths. For example, 30% of coronary heart disease and stroke was prevented by 2.5 h of brisk walking (>3 miles/h) each week, compared with those who performed less than this amount of physical activity in a large population of Harvard nurses. If the preventive effects of undertaking moderate-intensity physical activity [i.e., activity performed at three to six times the basal metabolic rate, which is the equivalent of brisk walking at 3-4 miles/h for most healthy adults] were to be similar for all causes of cardiovascular disease, then 284,886 deaths from cardiovascular disease would be prevented (12% of all deaths in the United States).

### Congestive Heart Failure and Activity

The incidence and mortality rate of congestive heart failure (CHF) have been steadily increasing over the past 10 years. Approximately 4.6 million individuals in the United States have a diagnosis of CHF, with 400,000 new cases occurring and 43,000 individuals dying annually. Hospitalizations from CHF increased from 377,000 in 1979 to 870,000 in 1996 .

Lack of physical activity is considered an independent risk factor for the development of CHF. In addition, other primary risk factors include obesity, hypertension, and diabetes. According to He et al, physical inactivity can account for 9.2% of all cases of CHF, whereas hypertension can account for 10.2%, diabetes for 3.2%, and obesity for 8.0%.

Patients diagnosed with CHF benefit greatly from participating in exercise-training programs. For example, exercise training of patients with moderate to severe CHF lowered all-cause mortality by 63% and reduced hospital readmission for heart failure by 71%. Therefore, physical inactivity can directly or indirectly account for the development of a significant percentage of cases of CHF and also exacerbate conditions associated with previously diagnosed CHF patients.

Bed rest and exercise restriction lead to deconditioning and increased morbidity in patients with symptomatic heart failure. Conversely, the evidence is quite clear that exercise improves the overall function and exercise capacity of people afflicted with CHF.

## Inactivity and Hypertension

From 44 randomized trials of physical training, it was concluded that sedentary populations had blood pressures that were higher by 2/3 (systolic/diastolic) mmHg in normotensive subjects and by 7/6 (systolic/diastolic) mmHg in hypertensive patients compared with the physically active groups.

Patients with mild untreated essential hypertension who briskly walked for 30 min five to seven times per week for 12 wk lowered their systolic and diastolic blood pressures. There was an opposite relationship between change in total cholesterol to HDL cholesterol ratio and the increase in maximal forearm blood flow after the 12-wk training in these hypertensive patients. This suggested that the training improved the functioning of the arteries thereby improving the blood pressure.

## Physical Inactivity and Stroke

Physical inactivity increases the risk of stroke. At least 22 publications report that regular exercise reduces the risk of ischemic stroke in men and women. A statement for healthcare professionals from the Stroke Council of the American Heart Association made the recommendation that, as per guidelines endorsed by the Centers for Disease Control and Prevention and the National Institutes of Health, regular exercise (>30 min of moderate-intensity activity daily) is part of a healthy lifestyle and helps to reduce conditions that may lead to stroke. The effect of physical activity's prevention of stroke seems more convincing for ischemic stroke (stroke due to decreased oxygen to the brain) than for hemorrhagic stroke (stroke due to bleeding into the brain).

It has been suggested that the protective effect of physical activity may be partly mediated through its effects on various risk factors for stroke. Physical activity lowers:

- blood pressure,
- increases HDL cholesterol concentration,
- is associated with reductions in plasma fibrinogen level and platelet aggregation,
- elevates plasma tissue plasminogen activator activity.
- facilitates weight loss and
- weight maintenance.

Convincing epidemiological data demonstrate that the beneficial effects of physical activity on the risk of Type 2 diabetes is an important risk factor for stroke.

## Physical Inactivity and Type II Diabetes Mellitus

The prevalence of obesity and Type 2 diabetes continues to increase among US adults and is classified as an "epidemic" by the Centers for Disease Control. The Centers for Disease Control has written, "restoring physical activity to our daily routines is crucial to the future reduction of diabetes and obesity in the US population." The overall prevalence of Type 2 diabetes among adults of industrialized countries ranges from 6 to 10%, but it is only 0-2% in native populations that have maintained a lifestyle of the hunter-gatherer cultures. Another example was provided by Hu et al., who found that 91% of the cases of Type 2 diabetes in the Harvard nurse's study could be attributed to habits and forms of behavior that did not conform to the low-risk pattern. They defined "low risk" as a combination of five variables:

- a BMI <25,
- a diet high in cereal fiber and polyunsaturated fat and
- low in transfat and glycemic load,
- engagement in moderate-to-vigorous physical activity for at least 0.5 h/day,
- not currently smoking,

We provide this list to emphasize that physical inactivity is but one factor contributing to those environmental factors that cause 91% of Type 2 diabetes in the United States. However, lack of physical exercise is a quantitatively important environmental contributor, as shown by a clinical trial.

## Obesity and Physical Inactivity

Each year, an estimated 300,000 adults die of causes related to obesity, making it the second greatest environmental cause of death after tobacco. Data for adults suggest that overweight prevalence has increased by more than 50% in the past 10 yr. An overweight condition is the most common health problem facing American children, particularly for African Americans and Hispanics. More than one decade ago, the direct costs of obesity and physical inactivity accounted for 9.4% of the US health care expenditures; therefore, these cost must be greater now.

Sedentary individuals can lower their risk of many chronic disorders by increasing physical activity, regardless of whether they are normal or overweight. Blair and Brodney found the following.

Regular physical activity appears to provide substantial protection against coronary heart disease, especially in overweight men.

Regular physical activity appears to reduce the risk of developing hypertension in men with elevated BMI, and this reduction was greatest in men with the high BMI categories.

Physical fitness has the same protective effect in normal-weight diabetic men as in overweight diabetic men.

Studies have demonstrated that weight loss is not necessary for individuals to benefit from the effects of physical activity on glucose tolerance and insulin sensitivity. Inactive women with BMIs  $<29$  have a slightly higher relative risk of 0.79 for coronary heart disease than active women with BMIs  $>29$  whose relative risk is 0.69. Moderate-intensity aerobic training had a favorable effect on glucose tolerance in older people, independent of changes in abdominal adiposity.

Increasing physical activity from sedentary levels to 30 min of moderate activity each day will also lower the prevalence of these conditions within the same BMI. These data suggest that America's emphasis on loss of body weight in overweight individuals, although appropriate, usually overlooks, equal mention that inactivity, alone, worsens the prevalence of most chronic health disorders without a change in BMI. The health outcomes from campaigns to lower the number of calories consumed each day would be improved if a greater emphasis on moderate physical activity were included with eating less.

### Physical Inactivity and Gallbladder Disease

Chuang et al. demonstrated that low levels of physical activity are associated with gallstone formation. Sedentary behavior, as assessed by time spent sitting, was positively associated with the risk of cholecystectomy in a prospective study of 60,290 women. In the same study, an average of 2-3 h of recreational exercise per week appeared to reduce the risk of cholecystectomy by 20%.

There are multiple suggestions for the mechanism(s) by which physical inactivity produces gallstones. Leitzmann speculated that there are probably several metabolic pathways by which physical inactivity may increase the risk of gallstone disease, independent of the effect of physical inactivity on body weight. For example, physical inactivity could increase the risk for gallstones by increasing glucose intolerance even in the absence of weight loss, raising biliary cholesterol levels, thus preventing cholesterol from precipitating in the bile, increasing serum triglyceride levels, increasing exposure to ovarian hormones, and slowing colonic transient time, all factors related to an increased

risk of developing gallstones. Heaton indicated that physical inactivity is a plausible cause of gallstones because its metabolic consequences are similar to those of obesity, including insulin resistance and hyperinsulinemia.

### Physical Inactivity and Breast Cancer

Friedenreich stated that 23 of 35 studies conducted to date show an increased risk in breast cancer for those women who are physically inactive. Lee analyzed nearly 40,000 women and concluded that lower levels of physical activity may increase the risk of breast cancer only in postmenopausal women.

### Physical Inactivity and Colon Cancer

The estimates for 2002 in the United States are that there will be 107,300 new cases of colon cancer with 48,100 deaths from this disease; colon cancer is the third highest site-specific cancer. Tomeo concluded that physical inactivity was the risk factor most consistently shown to be associated with an increased risk of colon cancer. A 50% reduction in the incidence of colon cancer was observed among those with the highest level of physical activity across numerous studies. Thus 50,000 cases and 24,000 deaths from colon cancer could have been prevented each year in the United States by more physical activity. Sedentary individuals have twice the incidence of colon cancer compared with those with the highest level of activity across numerous studies that used different measures of activity (occupational or leisure-time activity).

Five potential mechanisms by which physical inactivity could increase the risk of colon cancer were proposed in a recent review. Physical inactivity could:

- lengthen gastrointestinal transient time, thereby maximizing contact with potential carcinogens,
- increase circulating levels of insulin, promoting the growth of colonic epithelial cells,
- alter prostaglandin levels,
- depress immune function, and
- modify bile acid metabolism.

### Physical Inactivity and the Immune System

Physical inactivity increases susceptibility to viral infections compared with moderate levels of physical activity. Although infections are not a chronic health condition, inactivity also increases the risk on many site-specific cancers. As a consequence, it is feasible that inactivity could play a role in chronic diseases associated with its suppressed

immune function. With regard to the acute exercise effects on the immune response, it has been shown that natural immunity is enhanced during moderate exercise.

#### Conclusion:

And the list could go on and on and on. The only proper response is “get active.” The best prescription your doctor or nurse practitioner can give you is an “exercise prescription.” Never seen one? At SETMA, we can give you one every time you see a health care provider. Expect it! Demand it! After all, it is your life and it is your health.