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SUPPLEMENT

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SEDENTARISM AND CARDIOVASCULAR RISK

HUGO MILIONE, ROBERTO PARODI, EMILIO BUCHACA FAXAS, LUIS ROJAS ORELLANA, MARÍA LUCÍA FORTUNA PERALTA, CINTHIA CORAL CRISTALDO, JOSÉ ORTELLADO

Current state of knowledge

Physical inactivity (PI) has become one of the most important risk factors in the development of chronic non-communicable diseases (NCDs) worldwide[1]. The prevalence of a high sedentary lifestyle ranges between 60 and 71% worldwide[2].

Being inactive is defined as <150 min of physical activity (PA) of moderate or vigorous intensity per week or its equivalent to perform < 600 Metabolic-energy-equivalents [METs]/minute/week. There are different questionnaires to detect a sedentary lifestyle within primary care consultations, such as the International Physical Activity Questionnaire (IPAQ)[3].

PI has been established as a risk factor that explain the development of 6 to 10% of obesity, type 2 diabetes mellitus (T2DM), high blood pressure (HBP), metabolic syndrome, cardiovascular diseases (CVDs), breast and colon cancer. and mortality[4-7]. PA benefits also include prevention of falls and osteoporosis; reduction in depression, anxiety disorders; improvement on sleep quality, memory, and general feeling of well-being[8].

PI refers to activities such as prolonged sitting, watching television, driving, among others[9]. It is globally estimated that between 55% and 70% of the daily activities are sedentary (without considering the time spent sleeping)[4,10,11].

Approximately 9% of premature deaths are associated with PI. This is equivalent to 5.3 million deaths per year[12]. From an economic perspective, the global cost associated with PI in 2013 was 53.8 billion dollars (53.8 billion)[13].

Finally, despite of the amount of scientific evidence that confirms the benefits of regular practice of PA, currently, 31.1% of the adult population worldwide does not meet the minimum recommendations[1,14].

Regular PA and exercise training (ET) induce a wide range of direct and indirect physiological adaptations and pleiotropic benefits for general human and cardiovascular health[15].

Risks

The increase in time devoted in sedentary activities correlates with an increase in cardiovascular and metabolic risk factors. This effect is independent of sociodemographic factors, diet, body mass index (BMI) and PA, as it would not be modulated by greater caloric intake, but rather by reduced energy expenditure.

This may be related to the excessive time spent on sedentary activities, where energy expenditure is less than 1.5 kcal/kg/h[16].

• There is an inverse relationship between PA and obesity, T2DM, HBP, and metabolic syndrome[12,14,17].

• There is a linear relationship between sedentary lifestyle behavior and HBP risk[18].

• There is a linear relationship between sedentary lifestyle and higher likelihood of presenting metabolic syndrome[19, 20].

• There is a linear relationship between sedentary lifestyle and the risk of development T2DM, independent of the demographic characteristics of age, sex, race/ethnicity, and socioeconomic status[7, 21-23]. The greatest harmful effects of a sedentary lifestyle were observed in markers of diabetes mellitus, including blood glucose, insulin, and markers of insulin resistance[24].

• Regular PA significantly impacts the cardiometabolic status of patients with T2DM by reducing daytime hyperglycemia, supporting the recommendation, even during postprandial periods[25].

• For each extra hour of sedentary activity per day, there is a corresponding rise of 0.06 mmHg in systolic blood pressure (SBP) and 0.20 mmHg in diastolic blood pressure (DBP). Time spent in sedentary behaviors is also associated with the development of cardiovascular disease[12].

• There is a linear relationship between sedentary behavior and a greater likelihood of developing fatal and non-fatal CVD[26-29]. The association between sedentary behavior and the incidence of CVD does not appear to be appreciably altered by the inclusion of BMI as a covariate[27].

• Various prospective cohort studies have shown significant associations between sedentary behavior and mortality risk. Deaths from all causes, CVD, cancer, and other causes of mortality were significantly related to sedentary activity[30-32].

Recommendations

Interventions should focus on reducing ***sedentary time***. Strategies should concentrate on addressing the ***sedentary behavior*** directly rather than relying on the incidental impact of heightened PA[33,34]. Interventions should primarily address environments most associated with sedentary behavior: watching television and the workplace (prolonged sitting)[35].

In this regard, there are many workplace interventions that have implemented workstations designed to facilitate PA, effectively curbing sedentary behavior by providing office workers with the option to stand, walk, or pedal while engaging in their routine computer and desk-related tasks. The installation of such workstations can lead to substantial reductions in sedentary time[36].

The recommendations for adults to modify sedentary behavior, are to perform moderate aerobic PA for at least 150 to 300 minutes; or vigorous aerobic PA for at least 75 to 150 minutes; or an equivalent combination of moderate and vigorous activities throughout the week. They should also engage in moderate or more intense muscle-strengthening activities that exercise all major muscle groups for two or more days a week, as such activities provide additional health benefits. Older adults should perform varied PA with different components, emphasizing functional balance and moderate to high-intensity muscle strength training three or more days a week to improve functional capacity and prevent falls.

Finally, to achieve additional health benefits, it is recommended to extend moderate aerobic PA beyond 300 minutes, engage in vigorous aerobic activities for more than 150 minutes, or pursue an equivalent combination of moderate and vigorous activities throughout the week[37].

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