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The Effects of Physical Activity on Disease and Mortality

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Abstract

Physical activity (PA) provides great opportunities to improve and maintain health, including reducing the risk of developing and developing various non-communicable diseases, while physical inactivity (PI) is associated with early onset of non-communicable chronic diseases, leading to health problems and mortality from all causes, regardless of other risk factors. Relevant literature reviewed the problem was reviewed, where the goal was to see how phisycal activity affects certain noncommunicable diseases and whether it leads to symptom relief and reduced mortality. The effects of phisycal activity on coronary heart disease and myocardial infarction were positive if moderate aerobic phisycal activity was trained for 3 to 5 weeks for 30 minutes; to obesity, where higher fitness levels were associated with a lower risk of mortality; in type 2 diabetes mellitus, walking and cycling three times a week for 30 to 40 minutes shows little but significant progress in glucose control in diabetics, and the recommendation is to exercise aerobic activities amounting to 55% to 85% of maximum heart rate; and the effects of phisycal activity on cancer, where research has shown that moderate-intensity physical activities, ranging from 210 to 420 minutes per week, have great benefits in reducing the risk of some types of cancer and mortality, and that 150 minutes has shown no major health benefits.

Keywords: physical activity, benefits, diseases, mortality

Introduction

Physical activity (PA) is defined as any body movement caused by skeletal muscles, which results in energy consumption (Caspersen, Powell, & Christenson, 1985).

Non-communicable diseases (NCDs) represent a dominant global and global health interest. According to data published by the World Health Organization (WHO), NCDs, where the dominant role is played by diseases of the heart and blood vessels, carcinogens and diseases of the body, diabetes and chronic respiratory diseases account for 63% of the total number of deaths in children, with more than 14 million people dying between the ages of 30 and 70 (WHO, 2010). Such deaths are estimated to represent 1 in 10 deaths in a wide range of fetuses and are a major risk factor (Lee, Shiroma, Lobelo, Puska, Blair, et al. 2012).

The PA provides a lot of opportunities for development and health preservation, including reducing the risks of various diseases and the functional abilities of those with poor mental, physical and social health (Holtermann, Mortensen, Sogaard, Gyntelberg, & Suadicani, 2012; Arem, Moore, Patel, Hartge, de Gonzalez, et al. 2015; Martinez-Gomez, Guallar-Castillon, Mota, Lopez-Garcia, & Rodriguez-Artalejo, 2015; Hupin, Roche, Gremeaux, Chatard, Oriol, et al. 2015; Barengo, Antikainen, Borodulin, Harald, & Jousilahti, 2017; Higueras-Fresnillo, Guallar-Castillon, Cabanas-Sanchez, Banegas, Rodriguez-Artalejo, et al. 2017; de Oliveira, Oancea, Nucci, & Vogeltanz-Holm, 2018).

The Physical Activity Guidelines Advisory Committee (PAGAC, 2008) has found that scientific evidence indicates that PA decreases risks of premature death, heart stroke, coronary heart disease, hypertension, and type 2 diabetes, colorectal and breast cancer, brain stroke, and uremia, as scientific evidence has shown that PA maintains the functional abilities of older adults, helps prevent weight loss, reduces sleep quality, and reduces the risk of hip fracture and osteoporosis (Blair, Cheng, & Holder, 2001). Thus, 150-300 minutes per week, aerobic PA of moderate intensity is an important health benefit for the older population, a minimum of 150 minutes per week of aerobic PA or 75 minutes per week of aerobic activity of moderate intensity or an equivalent combination of aerobic activity and moderate intensity (WHO, 2010; Arem et al., 2015).

Physical activity and health benefits

Previous researches confirm that PA positively affects health (Boreham & Roddoch, 2001; Pori, M., Pori, P., Pistotnik, Dolenec, Tomažin, et al. 2013). The health benefits of exercise are partially related to the favorable modulations of cardiovascular risk factors observed with increased patterns of PA or structured exercise programs. (Mora, Cook, Buring, Ridker, & Lee, 2007). Thus, PA has positive effects on perception, concentration (Trudeau & Shephard, 2008; Centers for Disease Control and Prevention - CDCP, 2010), and self-respect (Weiss & Williams, 2004; Crocker, Sabiston, Kowalski, McDonough, & Kowalski, 2006; Moreno, Cervelló, & Moreno, 2008), whilst reduce anxiety and stress simultaneously (Flook, Repetti, & Ullman, 2005; Dolenc, 2015). It has preventive and therapeutic effects on several diseases and conditions and contributes to the quality of life in many ways (Physical Activity Guidelines for Americans - PAGA, 2008; Janssen & LeBlanc, 2010; WHO, 2010; Gill, Hammond, Reifsteck, Jehu, Williams, et al. 2013). PA is a key contributor to energy consumption and is also a key contributor to energy balance and weight control, as well as to good health (WHO, 2002; WHO, 2007).

According to Physical Activity Guidelines for Americans, the health benefits of practicing PA are as follows: regular PA reduces the risk of many adverse health outcomes; that any PAs are better than none; for most health outcomes, additional benefits arise as the amount of PA increases with greater intensity, higher frequency, and / or longer duration; most health benefits occur with at least 150 minutes per week of moderate PA, such as brisk walking and additional benefits occur with more PAs; aerobic (endurance) and PA for muscle strengthening (resistance) are useful; health benefits occur in children and adolescents, young and middle-aged people, older adults and people with disabilities; and the benefits of PA far outweigh the possibility of adverse outcomes (PAGA, 2008).

Physical inactivity

Physical inactivity (PI) can be described as a condition in which physical movement is minimal and energy expenditure is close to resting metablism (International Agency for Research on Cancer - IARC, 2002). It is associated with the early onset of non-communicable chronic diseases leading to health problems and death from all causes, regardless of other risk factors (Lee et al., 2012; Ekelund, Steene-Johannessen, Brown, Fagerland, Owen, et al. 2016; Kyu, Bachman, Alexander, Mumford, Afshin, et al. 2016) and it has been identified as the fourth leading factor of global mortality (6% of deaths worldwide). It is just behind high blood pressure (13%), tobacco use (9%), high blood glucose levels (6%), and overweight and obesity which are responsible for 5% of global mortality (WHO, 2009). People who are insufficiently active have a 20% to 30% higher risk of death compared to people who are physically active or practice the recommended amount of PA (WHO, 2010).

Also, PI is a variable risk factor of cardiovascular diseases and a number of other chronic diseases, such as obesity, hypertension, diabetes mellitus, cancer (colon and breast), depression, bone and joint diseases (osteoporosis and osteoarthritis). (Blair et al., 2001; Lee & Skerritt, 2001; Warburton, Gledhill, & Quinney, 2001; Taylor, Brown, Ebrahim, Jolliffe, Noorani, et al.2004). The high risk of developing the mentioned diseases, as well as other health problems, occurs due to the deterioration of physical health and due to insufficient PI. (Balboa-Castillo, Guallar Castillón, León-Muñoz, Graciani, López-García, et al. 2011; Cadore, Rodriguez-Manas,Sinclair, & Izquierdo, 2013).

Effects of PA on coronary disease, myocardial infarction and reduction of mortality

Myocardial infarction is an acute manifestation of coronary artery disease, which affects the heart and blood vessels, where there is a thickening of the inner wall of the arteries, which block or reduce blood flow to the heart, causing damage to the heart muscle (Lu, Liu, Sun, Zheng, & Zhang, 2015). This disease is considered to be one of the most well-known cardiovascular diseases (WHO, 2016) which can create major problems when it comes to the physical, mental and social aspects of life and is the leading cause when it comes to morbidity and mortality (Feitosa-Filho, Baracioli, Barbosa, Franci, Timerman, et al. 2015).

Current evidence suggests that regular FA has the greatest benefit for heart health (Nocon, Hiemann, Müller-Riemenschneider, Thalau, Roll, et al. 2008; PAGA, 2008; Warburton, Charlesworth, Ivey, Nettlefold, & Bredin, 2010) and that men who maintain an active lifestyle have 50% lower risk of death or disease (Myers, Kaykha, George, Abella, Zaheer, et al. 2004), and when it comes to women the risk reduction is between 30-40% (Manson, Greenland, LaCroix, Stefanick, Mouton, et al. 2002). By maintaining an active lifestyle and a moderate level of aerobic capacity, ie. general endurance, reduced mortality due to coronary heart disease is reduced. Regular walking leads to a reduction in the incidence of cardiovascular diseases (Sesso, Paffenberger, & Lee, 2000). Also, cycling to work (Andersen,

Schnohr, Schroll, & Hein, 2000) and four hours of recreational activities per week (Wannamathee, Shaper, & Alberti, 2000) are associated with a reduced risk of heart diseases. Consumption of minimum of 800 kcal (kilocalories) per week is associated with reduced risk of health problems,and a physically active lifestyle is useful in the rehabilitation of heart disease, with exercise-based recovery reducing the secondary mortality rate by about 27% (Jolliffe, Rees, Raylor, Thompson, Oldridge, et al. 2001).

Exercise alone is crucial in rehabilitation just after myocardial infarction. Aerobic endurance training, dynamic training, as well as training to improve coordination and flexibility are specific recommendations for PA as part of a rehabilitation program (Bjarnason-Wehrens, Held, Hoberg, Karoff, & Rauch, 2007). What is important before the implementation of the program is to define the current level of training, as well as the risk that may occur due to PA based on the results of initial testing, the exercise program is modified based on current exercise capacity risk factors, motivation and tolerance (Fletcher , Ballads, Amsterdam, Chaitman, Eckel, et al., 2001; Ozgun et al., 2017).

The protective effect of PA from the mentioned non-communicable diseases is associated approximately 750-2000 kcal per week of moderate-intensity exercise, ie walking or running about 12-32 kilometers per week (Dishman, Heath, & Washburn, 2004). Also, a significant reduction in mortality risk, from 20 to 30%, was associated with energy consumption of approximately 1000 kcal, which was confirmed based on a review of 44 epidemiological studies and that the risk of mortality decreases with increasing PA of moderate intensity (Lee, & Skerritt, 2001; Myers et al., 2004). Dosed, controlled, and continuous PA reduces mortality, and the risk of complications during PA is negligible, especially if walking is practiced. Patients with a lower clinical picture should exercise moderate aerobic PA 3 to 5 times per week for 30 minutes under supervision in order to reduce the risk of death (WHO, 2010).

Effects of PA on obesity and reduction of mortality

Obesity is defined as the accumulation of excess body fat, usually ≥25% of total body weight for males and ≥33% for females (WHO, 1998). Overweight and obesity are associated with a higher risk of hypertension, coronary heart disease, stroke, type 2 diabetes, some types of cancer (breast, prostate) (Flegal, Graubard, Williamson, & Gali, 2007; Renehan, Tyson, Egger, Heller, & Zwahlen, 2008). Obesity not only directly increases the risk of coronary heart disease, but also indirectly increases it through its negative effects on several identified risk factors, including insulin resistance and hypertension (Kokkinos, 2012).

The decline in PA levels in daily life is a significant factor in the dramatic increase in the prevalence of overweight and obesity in Europe, where there is evidence that those who maintain a physically active lifestyle gain less weight with age than inactive people (PAGAC, 2008). Several studies have shown that an active lifestyle and daily PA play a significant role in obesity prevention (Di Pietro, 1999; Fogelholm & Kukkonen-Harjula, 2000). PA itself has an effect on weight loss and subcutaneous adipose tissue in combination with a programmed diet, which is an ideal formula in the correction of body structure (Wing, 1999; Donnelly, Blair, Jakicic, Manore, Rankin, et al. 2009) and easier maintain or reduce body weight for a longer period of time than individuals who rely solely on a diet (Wing, 1999).

There is also an inverse dose-response relationship, where those with the highest FA levels have the least chance of becoming obese with age, which can be a health problem and cause other diseases that can affect mortality and will require higher PA levels than recommended. to prevent this (PAGA, 2008; Moholdt, Wisløff, Lydersen, & Nauman, 2014). Interventional

studies have shown relatively moderate weight loss achieved by structured PA programs. However, the findings of large epidemiological studies support the concept that reduced mortality occurs in more active individuals regardless of body weight (King, Fitzhugh, Bassett, McLaughlin, Strath, et al. 2001), and that higher fitness levels were associated with a lower risk of mortality in males with normal weight, overweight and obesity (Wei, Kampert, Barlow, Nichaman, Gibbons, et al. 1999).

Effects of PA on type 2 diabetes melitus and reduction of mortality

Type 2 diabetes mellitus (T2DM) is a set of metabolic changes with different etiologies characterized by chronic hyperglycemia associated with changes in glucose, lipid, and protein metabolism due to insulin deficiency (WHO, 2016). Risk factors for DMT2 development include obesity, physical inactivity, age, smoking (CDC, 2012) and are the result of a complex interaction of environmental and genetic components, where there is strong evidence that such modified risk factors as obesity and physical inactivity are major nongenetic determinants of disease. (Tuomilehto, Lindström, Eriksson, Valle, Hämäläinen, et al. 2001). Most people with T2DM do not practice any type of PA, so the daily values of energy expenditure are significantly lower compared to people without the presence of a patient (Morrato, Hill, Wyatt, Ghushchyan, & Sullivan, 2007; Fagour, Gonzalez, Pezzino, Florenty, Rosette-Narece, et al. 2013; Balducci, D'Errico, Haxhi, Sacchetti, Orlando, et al. 2019), and PA deficiency and sedentary lifestyle are separate factors for the development of cardiovascular disease and increased mortality from T2DM (Biswas, Oh, Faulkner, Bajaj, Silver, et al. 2015; Sortsoe, Green, Jensen, & Emneus, 2016).

PA is one of the most important therapeutic steps in the treatment of people with T2DM (Hamasaki, 2016; Advika, Idiculla, & Kumari, 2017; Mohamed, Mahfouz, & Badr, 2020) and one of the best means of nonpharmacological treatment (Colberg, 2015). Regular physical exercise is an effective means of improving glycemia, reducing insulin resistance and stimulating insulin secretion (Hamasaki, 2016). Epidemiological findings also support that increased PA is associated with a lower risk of mortality in people with T2DM and the risk of all-cause mortality for diabetics with poor condition is more than 2 times higher compared to physically fit diabetics in both sexes, regardless of physical weight (Wei, Gibbons, Kampert, Nichaman, & Blair, 2000; Hu, Stampfer, Solomon, Liu, Colditz, et al. 2001; Church, LaMonte, Barlow, & Blair, 2005).

It was found, in a study of almost 6,000 male subjects, that for every 500 calories consumed per week due to PA, the risk of developing T2DM was reduced by 6% (Helmrich, Ragland, Leung, & Paffenbarger, 1991) and that any level of PA , in a cohort study of over 34,000 female subjects, reduced the risk of T2DM compared with a sedentary lifestyle (Folsom, Kushi, & Hong, 2000). Studies in the program, which included walking and cycling three times a week for 30 to 40 minutes, showed small but significant advances in glucose control in diabetics (Venditti, 2007) and that the most effective intensity of aerobic activity depends on individual characteristic of a T2DM sufferer, but is recommended to be 55% to 85% of the maximum heart rate (Achten & Jeukendrup, 2004).

Effects of PA on cancer and reduction of mortality

After heart disease, cancer is the second leading cause of death in Europe and routine PA, whether occupational or leisure, is associated with a reduced incidence of overall risk of developing the disease (Thune & Furberg, 2001; Lee, 2003). Cancer, as well as coronary heart disease, can be prevented to some extent by several risk factors, such as poor diet, obesity, or

physical inactivity. By improving some of these factors, regular exercise can explain the benefits of cancer mortality (Warburton et al., 2010).

Evidence of preventive action gave the best results for colon and breast cancer, where physically active men and women showed a 30-40% reduction in the relative risk of developing colon cancer, and women 20-30% reduction in the relative risk of developing breast cancer, compared with inactivity (Lee, 2003). Also, moderate and high-intensity activities have the most positive effects on the occurrence of colon cancer, reducing the risk of its occurrence by 40-50% (Lund Nilsen & Vatten, 2001).

Mechanisms by which PA can contribute to reducing cancer formation may be reduced inflammation (reduction of long-term intestinal inflammation, which can help reduce colon cancer), improved immune function, which allows to fight cancer, improved hormone balance, which reduces the likelihood of cancer who use hormones for growth and spread, such as breast cancer (Warburton et al., 2010). PA also has a positive effect on reducing the risk of lung cancer, with a risk reduction of about 40% (Tardon, Lee, Delgado-Rodriguez, Dosemeci, Albanes, et al. 2005), while there is no effect on reducing the incidence of prostate and testicular cancer (Dumitrescu & Cotarla, 2005).

Studies have shown that PAs of moderate intensity, ranging from 210 to 420 minutes per week, have great benefits, in order to reduce the risk of some cancers, as well as mortality, and that 150 minutes has not shown great health benefits. Furthermore, people who have been diagnosed with cancer and are physically active have a better quality of life than those who do not practice PA (PAGA, 2008). Little attention has been paid to the impact of PA in the treatment of cancer patients, where there is no evidence that disease progression can be reduced by exercise, but research has shown that PA has a positive effect on quality of life, where psychological well-being, reduction of fatigue and nausea (Gotay, 2005).

Conclusıon

Physical activity (PA) plays a very important role in protecting and improving health. Research has shown that regular PA brings multiple health benefits and reduces mortality from non-communicable diseases associated with any cause. Involvement in activities of any type, from insufficient to recommended, can reduce mortality among adults who have not been active enough.

High levels of PA reduce the risk of mortality from all causes, ie by increasing from inactive or low levels, through moderate to high or strong, the percentage of deaths decreases, which clearly proves the health benefits of PA.The purpose and importance of the research must be stated at the end of the introduction.

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