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THE URGENT NEED FOR FAST IMPLEMENTATION OF PHYSICAL ACTIVITY AND EXERCISE IN ELDERLY PEOPLE

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Summary

Physical activity and exercise have become the most sensible and practical medicine. Together with a healthy diet, physical activity and exercise can protect individuals from and treat most chronic diseases in a different way from a small scale to completely. Both performing stent and bypass surgery or implementing diet and exercise to treat people with the same ailments, such as obesity, have had similar results after a few years. Relieving knee pain via surgery or exercise also has had the same result. These above are some of the abundant examples. Previous earlier papers and more recent ones have reported that physical activity protects elderly people against cardiovascular diseases, cancers, dementia, and Alzheimer's disease. In our paper we emphasise that it is necessary to speed up the implementation of physical activity and exercise in the general population, especially elderly people.

Key words: Physical activity, elderly people, diet, cardiovascular diseases.

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General statements about role of physical activity in elderly people

The evidence of the benefits from physical activity and exercise have been well documented in scientific papers for decades and have become one of the crucial, effective steps towards longevity and a high quality of life. Elderly people being active almost daily, in terms of sitting less and moving more, present proof of the benefits of physical activity and exercise. When we become sick, exercise helps us treat the disease. Physical activity has positive effects on our health such as prevention of cardiovascular diseases, cancer, dementia, and reducing inflammation [1]. Worldwide, physical inactivity is responsible for one fourth of communicable diseases [2]. After high blood pressure, which is the most important risk factor in the developed world for mortality, tobacco use, high blood glucose, and physical inactivity are the next highest risk factors for mortality [Figure 1] [3].

Exercise can prevent the detrimental effects of time spent sitting at work, or at home when we usually watch TV and other screens [4]. It is very important to change our lifestyle to start to eat a more healthy diet and to do moderate to vigorous physical activity to prolong lifespans [5]. Physical inactivity negatively contributes towards obesity, diabetes, and depression, which are determinants of premature deaths [6]. The newest study on functional decline in very elderly patients during acute hospitalization confirmed that exercise is able to reverse functional and cognitive impairment in elderly people [7]. Developed countries, united under the World Health Organization banner, were able to eliminate or decrease many infectious diseases and some communicable diseases but still face other health problems such as drug overdose or mental illnesses [8]. Despite genes, which cannot be changed, our lifestyle is able to alleviate genetic risk of chronic diseases if we stop using tobacco and alcohol, start exercising on a daily basis, and stick to a healthy diet. Exercise training causes coordinated reprogramming of the epigenome and the transcriptome in human skeleton, muscles and improvement of muscular strength [9–11]. Physical activity positively modulates gene expression [12]. Numerous studies presented have proved that genetic factors have a positive or negative influence on physical activity but underline the beneficial effects of training as a tool for non-pharmacological diseases preven-

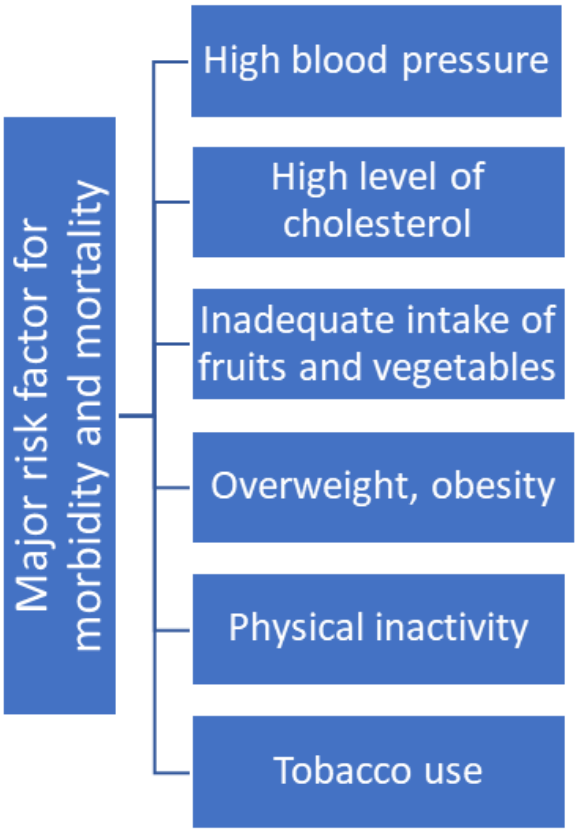

Figure 1: Major risk factor for morbidity and mortality [30]

tion and treatment [13, 14]. As we age and our telomeres shorten, it places individuals at a higher risk of premature death from predisposition to many illnesses. However, physical activity is able to slow the shortening of human telomeres [15, 16].

The role of physical activity in the prevention and treatment of cardiovascular diseases (CVD)

Cardiovascular diseases (CVD) have dominated in industrial countries for decades as a main factor of morbidity and mortality. Hypertension, diabetes, obesity, hypercholesterolemia, smoking, and physical inactivity play a negative role particularly when we age . The more we exercise, the more health benefits we have. Intensity, duration, and frequency of physical activity play a dominant role in reducing mortality and morbidity rate [17, 18]. Lowering blood pressure in hypertensive patients is one of the most important goals to avoid further detrimental consequences like coronary heart disease, heart attack, or stroke. The older population is at a about threefold higher risk of death than younger people. Just robust training, from moderate to intensive, has lowered mortality rate [Figure 2] [17, 18].

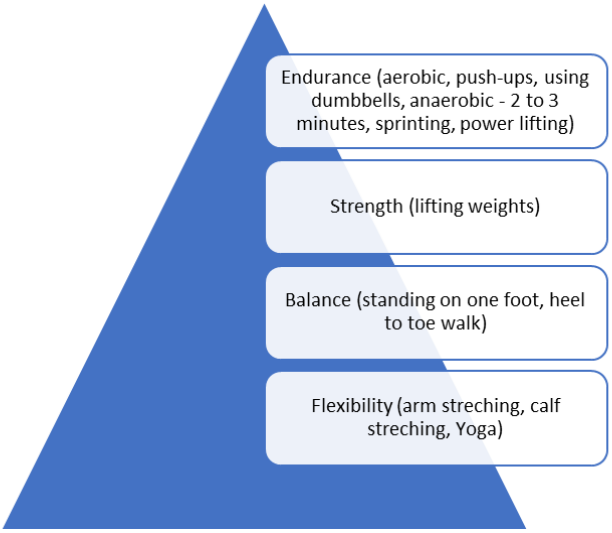

Figure 2: Categories of physical activity and exercise [1,10,11,12,31]

It is important to promote an active lifestyle at very little cost, as long as physical inactivity is modifiable risk factor of CVD. Promoting the implementation of programs which not only eliminate sedentary lifestyles, but also convince people to adopt both a healthy Mediterranean diet and moderate to vigorous exercise, in order to reduce cardiovascular diseases from 14% to almost 50%, is an important task of health services [19, 20]. The lack of physical activity is associated with reduced physical function including the following: slow gait and poor balance. According to new norms, hypertension is the major risk factor for stroke that should be intensively treated. Exercise together with pharmacological intervention or exercise alone protect humans 90% from stroke and 35% from dementia [21, 22].

Physical activity in cancer prevention and treatment

Cancers are the second leading cause, after cardiovascular diseases, of mortality in developed and developing countries. Worldwide, there are currently more than 18 million new cases of cancer each year and over 44 million cancer survivors. Early diagnosis of malignancies and improved methods of surgery, followed by radiation, chemotherapy, and other medical procedures, allow individuals with cancer to live longer. Exercise has lowered the risk of developing cancer, inhibited cancer growth, and improved treatment during cancer therapy [23–25]. After years of training, most people can exercise vigorously most days of the week. Exercise is very important for elderly men as a new study confirmed a strong correlation between regular vigorous training and less metastatic-lethal progression in prostate cancer [26]. Physical activity may help patients

with cancer who are under daily stress associated with uncertainty, pain, the side effects of therapy, and many other negative symptoms by improving their feeling and alleviating pain. This psychological stress can lead to acute heart failure. Continued chemotherapy and radiotherapy cause endothelial dysfunction, and this is associated with higher mortality. Cardiovascular disease very often occurs in patients with cancers and is one of the leading causes of their deaths. The importance of physical activity in a cancer patient has been documented as a main factor in reducing the incidence of cardiovascular disease. If people actively exercise before and after diagnosis of cancer, the chances to mitigate cardiovascular disease are greater, and active exercise may cause up to 37% of cancer reduction [27, 28].

Urgent need of physical activity implementation

The necessity of physical activity and exercise for maintaining health are both explained in numerous studies. What we need now is to push the implementation of physical activity and exercise as much as possible. There are many reasons for implementing physical activity. First, physically active people, in comparison to non-active, live longer and have less pain, imbalance, impaired strength, incidences of high blood pressure, and hipercholesterolemia. In the contemporary world a lot of people are overweight or even obese and have an inadequate intake of vegetables and fruits that leads to a poor quality of life and constitutes the main risk factors for heart failure and stroke [29, 30].There is a long list of many other illnesses in the older population that may be avoided by maintaining an active lifestyle. Most elderly people suffer from osteoarthritis, hypertension or type 2 diabetes [31], which may be improved with an active lifestyle.

Physical activity programs are described and detailed for people with cardiovascular disease, cancer and many other diseases [32], from the World Health Organization to national guidelines. All physical activity programs emphasise the urgent need for physical activity implementation. We have many recommendation programs for all ages to prevent and treat noncommunicable diseases (NCDs) [33]. The strategies aim at communities as well as individuals [34]. To conduct regular exercise we need stamina, strategies, and improved motivation [35,36]. There are very minimal risks or side effects of low to moderate physical activity and a huge advantage especially for elderly people [37].

Physical activity and evidence based medicine (EBM)

EBM presents proof that physical inactivity and the biological ageing process are correlated with the shortage of telomeres, increased risk of CVD, stroke, hypertension or type 2 diabetes, and cancer. Telomeres play a protective role for DNA, and physical activity has the potential to stop them from shortening. People who exercise moderately or vigorously have longer telomeres and reduced the risk of morbidity and mortality[15,16,23]. As people age, more cells are not able to repair or replicate leading to accumulation of defective cells . Senescent cells secrete harmful cytokines that induce chronic inflammation [15]. Physical activity plays a significant role in reducing the process of inflammation and reduces the amounts of inflammatory markers [17]. Exercise lowers insulin-like growth factor (IGF), and improves insulin sensitivity. Increased levels of insulin and IGF are linked to increased cell growth and increase the risk of cancers. Sex hormones like estradiol and estrone increase the risk of postmenopausal breast cancer, particularly in overweight and obese woman [23,24]. People who introduced regular exercise produce more antioxidant molecules:

- Superoxide Dismutase
- Glutathione
- Catalase

People who exercise are better protected against oxidising carcinogens [23,24]. Testosterone alone is responsible for the risk of prostate cancer. Increased levels of testosterone are successfully lowered by moderate, regular physical activity. Training increases levels not only catecholamines and leucocytes but also natural killer cells (NK), T cells, and B cells, which improve immunity and decreasing the risk of cancer [23,24,25].

Physical activity and the three mostly devastated culprits of premature death:

1. Cardiovascular diseases

Cardiovascular diseases are the most frequent cause of morbidity and mortality worldwide. One of the methods to stop or diminish the rate of cardiovascular events is routine, daily exercise [1]. According to WHO, physical inactivity is the fourth leading risk factor for mortality on our planet. Sedentary behaviours increase the risk of chronic diseases [3,4,5]. In the U.S., between 1996 – 2017, life expectancy was decreasing, and midlife mortality rate was up due to hypertension, stroke and diabetes [8]. Physical inactivity is responsible for 9% of all deaths, and 7% of deaths are due to inadequate cardiorespiratory exercise [12,13]. Our physical activity depends on genetic factors; therefore, some people respond better, with effective fitness, and others after the same amount of exercise have minor results [13,14,23]. Recently there is a positive trend of people living longer, e.g. by 2050 we expect in the world about 2 billion people to be over 60 years old, compared to 688 million in 2006 [17]. Today, still 30% of the world's population die because of cardiovascular disease. The older generation, being less active,

has a higher risk for chronic diseases. Their telomeres–DNA protein complexes becoming shorter are associated with a higher risk of cardiovascular disease. It was reported that almost four of five deaths occur in people over 65 years old[15,16,17].

2. Cancer

Cancers are the second leading cause of death after cardiovascular disease. More cancer survivors are in the older age group of people as treatment has improved over the last decades. The younger generation should be educated about the risk factors to avoid the development of cancer [23,24]. Physical activity is one of the best protective agents against cancer. Active people smoke less, and they eat a more healthy diet. The most important benefit of exercise however, is to reduce cancer incidence, tumour growth, and cancer metastasis [25]. Particularly older men should be convinced to exercise to lower risk of metastatic progression in prostate cancer [26]. Exercise reduces cardiovascular events in primary breast cancer in older women [28].

3. Dementia and Alzheimer disease

In the contemporary world dementia is on the rise, particularly in the developed countries, and two thirds of people with dementia have an Alzheimer disease. Recent studies pointed to hypertension and physical inactivity as a culprit and the main risk factors for this debilitated illnesses. It has been reported that Alzheimer and dementia cause premature death. In summary, it can be stated that lifestyle factors like healthy diet, lower alcohol consumption, not smoking , and exercise can prevent and lower risk of dementia [5,8,9,15,18,21]. Exercise can lower high blood pressure as a means to prevent stroke. What is important is that in preventing dementia and hypertension we can diminish and prevent stroke incidence [22,30,33].

Conclusion

In our review, we concentrated mostly on three domain of health problems: cardiovascular diseases, cancer, and dementia, which end a huge percentage of people's lives too early and ruin their quality of life.
It is very difficult to find harmful side effects of reasonably performed physical activity and exercise but easy to understand the potent and vitally positive, biological role of physical activity and exercise. We did not try to describe all the details of light, moderate, vigorous, or intense exercise, but it is easy to find them in the papers listed below.
Physical inactivity is the fourth leading risk factor for global mortality rate, after high blood pressure, smoking, and high blood glucose.
It is expected that in 2050 as many as 2 billion people will be over 60 years old, so we have to find methods for convincing them to implement exercise.
According to the WHO, the death rate due to CVD is steadily on the rise, but physical activity is one of the major modifiable risk factors for preventing hypertension, coronary heart disease, heart attack, and stroke.
The more we exercise, the more benefits for healthy living, less cancer, less cancer while implementing other cancer treatments, and less side effects like fatigue or muscles weakness. As most of the experts agree, about 50 per cent of all cancer can be avoided after the implementation of a healthy lifestyle, including physical activity. There are as many as 13 different cancers mentioned in literature to be reduced during people's lifespans after regular exercise.
Changes in habit need time and perseverance. From the family doctors to the best scientific institutions in the World, we can find physical activity and exercise programmes which can be individually adopted.
According to the WHO, the cost of physical inactivity in 2013 was 54 billion dollars in direct health care, additionally accompanied by a decrease in productivity which cost 14 billion dollars.
Enhanced physical education in schools, encouraging the community to exercise, improving motivation to become physically active is the highest priority task of the health services in the modern world.

The benefits of physical activity and exercise:

- decrease in all causes of mortality
- decrease cardiovascular mortality; prevent hypertension, coronary heart disease, and stroke, lower TG and LDL cholesterol level, as well as raise HDL cholesterol level, and lipid accumulation
- prevent cancer: breast, colon, colorectal and the other cancers; and allow patients to better tolerate cancer therapy, and improve overall survival among cancer patients
- prevent Alzheimer's disease, dementia, depression, anxiety, shear stress on the vascular bed; and improve cognitive function, self-esteem, optimism, memory; as well as create new brain cells
- reduce diabetes, and lower insulin resistance and blood glucose level
- prevent obesity
- prevent osteoporosis, and increase muscles and bones strength, as well as prevent weakness
- lower levels of hormones: insulin, oestrogen, and growth factors
- reduce inflammation
- improve immune system function
- increase oxygen levels
- work to prevent the use of medicine and therapy

- better sleep
- better function
- reduce harmful cellular growth
- reduce apoptosis
- reduce arterial stiffness
- effect heat production

Implementation of the physical activity and exercise

- the programs for community and individuals
- exercise program schedule
- an exercise booklets with instructions
- physical activity promotion
- education in physical activity methods of population
- physical activity monitoring and evaluation
- the enhancement of governmental and non-governmental institutions, organizations to be involved
- information via media - TV, newspapers, radios
- create friendly environments for exercise
- the use of active transportation such as bicycling or walking to go to school, work, shopping, etc.

Exercise [1,10,11,12,24]

- Light (slow walking)
- Moderate (raise heart rate, breathe faster, feel warm, 40% of maximal oxygen uptake)
- Vigorous (breath hard, raise heart rate, feel hot, sweating, 80% of maximal oxygen uptake)

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Literature

[1] Elmagd A.M. et al. Benefits, need and importance of daily exercise. *IJPESH*, 3(5):22–27, 2016.

[2] Kumar R. The benefits of physical activity and exercise for health. *RRIJM*, 2(2), 2017.

[3] Cekin R. Pschological benefits of regular physical activity: evedence from emerging adults. *Universal Journal of Educational Research*, 3(10):710–717, 2015.

[4] Ekelund U. et al. Does physical activity attenuate, or even eliminate, the detrimental association of sitting time with mortality a harmonized meta–analysis of data from more than 1 million men and women. *The Lancet*, 388(10051), 2016.

[5] Rea M.I. Towards ageing well: Use it or lose it: Exercise, epigenetics and cognition. *Biogerontology*, 18(4):679–691, 2017.

[6] Lightfoot T.J. et al. Biological genetic regulation of physical activity level: consensus from genbiopac. *Med. Sci. Sports Exerc*, 50(4):863–873, 2018.

[7] Martinez-Velilla N. et al. Effect of exercise intervention on functional decline in very elderly patients during acute hospitalization. *JAMA Intern. Med*, 179(1):28–36, 2019.

[8] Woolf H.S. et al. Life expectancy and mortality rates in the united states, 1959-2017. *JAMA*, 322(20):1996–2016, 2019.

[9] Lourida L. et al. Association of lifestyle and genetic risk with incidence of dementia. *JAMA*, 322(5):430–437, 2019.

[10] Lindholm M.E. et al. An integrative analysis coordinated reprogramming of the epigenome and the transcriptome in human skeleton muscle after training. *Epigenetics*, 9(12):1557–69, 2014.

[11] Denham J. et al. Epigenetic changes in leukocytes after 8 weeks of resistance exercise training. *Eur J Appl Physiol*, 116(6):1245–53, 2016.

[12] Grazioli E. et al. Physical activity in the prevention of human diseases: role of epigenetic modification. *BMC Genomics*, 18(8):802, 2017.

[13] Zadro R.J. et al. The beneficial effects of physical activity: is it door to your genes a systematic review and meta–analysis of twin and family studies. *Sports Med Open*, 3(4), 2017.

[14] Kujala M.U. Physical activity, genes, and lifetime predisposition to chronic disease. *Eur Rev Aging Act*, 8:31–36, 2011.

[15] Ludlow T.A. et al. Physical activity and telomere biology: exploring the link with aging–related disease prevention. *Journal of Aging Research*, 790378, 2011.

[16] Arsenis N.C. et al. Physical activity and telomere length: impact of aging and potential mechanisms of action. *Oncotarget*, 8(27):45008–45019, 2017.

[17] Lillo N. et al. Role of physical activity in cardiovascular disease prevention in older adults. *Sport Sci Health*, 11(3):1–7, 2015.

[18] Kokkinos P. et al. Exercise and physical activity. clinical outcomes and applications. *Circulation*, 122:1637–1648, 2010.

[19] Arija V. et al. Effectiveness of a physical activity program on cardiovascular disease risk in adult primary

health–care users: the "pas–a–pas" community intervention trial. *BMC Public Health*, 17(576), 2017.

[20] Lanier B.J. et al. Diet and physical activity for cardiovascular disease prevention. *Am Fam Physician*, 93(11):919–924, 2016.

[21] Rasmussen H.J.L. et al. Association of neurocognitive and physical function with gait speed in midlife. *JAMA Netw Open*, 2(10), 2019.

[22] Hachinski V. et al. Preventing dementia by preventing stroke: The berlin manifesto. *The Journal of Alzheimer's Association*, 15(7):961–984, 2019.

[23] Thomas J.R. et al. Exercise–induce, biochemical changes and their potential influence on cancer: a scientific review. *Br J Sports Med*, pages 1–8, 2016.

[24] Brown C.J. et al. Cancer, physical activity, and exercise. *Compr. Physiol*, 2(4):2775–2809, 2012.

[25] Hojman P. et al. Molecular mechanisms linking exercise to cancer prevention and treatment. *Cell Metabolism*, 27, 2018.

[26] Dai J.Y. et al. Vigorous physical activity is associated with lower risk of metastatic-lethal progression in prostate cancer and hypomethylation in the cracr2a gene. *Cancer Epidemiol Biomakers Prev*, 28(2):258–264, 2019.

[27] Cammann LV. et al. Clinical features and outcomes of patients with malignancy, and takotsubo syndrome: observations from the international takotsubo registry. *Journal of the American Heart Association*, 8(15), 2019.

[28] Okwuosa M.T. et al. Pre–diagnosis exercise and cardiovascular events in primary breast cancer. *JACC: CardioOncology*, 1(1), 2019.

[29] Gardner M.M. et al. Practical implementation of an exercise–based falls prevention programme. *Age and Ageing*, 30:77–83, 2001.

[30] A guide for population-based approaches to increasing levels of physical activity: implementation of the who global strategy on diet, physical activity and health. *World Health Organization*, 2007.

[31] 2018 physical activity guidelines advisory committee. 2018 physical activity guidelines advisory committee scientific report. *Washington, DC: U.S.Department of Health and Human Services*, 2018.

[32] Stefani L. et al. Clinical implementation of exercise guidelines for cancer patients: adaptation of acsm's guidelines to the italian model. *J.Func.Morphol.Kinesiol*, 2(4), 2017.

[33] Global action plan on physical activity 2018-20130. more active people for a healthier world. *World Health Organization*.

[34] Centers for disease control and prevention. strategies to prevent obesity and other chronic diseases: The cdc guide to strategies to increase physical activity in the community. *Atlanta: U.S.Department of Health and Human Services*, 2011.

[35] Rhodes RE. et al. How big is the physical activity intention-behaviour gap a meta-analysis using the action control framework. *Br J Health Psychol*, 18(2):296–309, 2013.

[36] Rhodes RE. et al. Models accounting for intention-behavior discordance in the physical activity domain: a user's guide, content overview, and review of current evidence. *Int J Behav Nutr Phys Act*, 7:12–9, 2015.

[37] O'Keefe H.J. et al. The goldilocks zone for exercise: not to little, not to much. *Missouri Medicine*, 115(2):98, 2018.

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