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**Alexandra Ivanovna Mikheeva**
Fergana Polytechnic Institute
Senior Lecturer of the Department of Physical Culture and Sports,
Fergana, Uzbekistan
g7777@mail.ru

# PHYSICAL ACTIVITY AND ITS IMPACT ON THE PREVENTION AND TREATMENT OF CARDIOVASCULAR DISEASES

***Abstract***: *Over the past 4 decades, numerous scientific reports have examined the relationships between physical activity, physical fitness, and cardiovascular health. It is widely accepted that regular physical activity is beneficial for cardiovascular health. Frequent exercise is robustly associated with a decrease in cardiovascular mortality as well as the risk of developing cardiovascular disease. This article reviews the role of physical activity in the prevention and treatment of cardiovascular disease. It provides a brief summary of the latest knowledge based on systematic reviews and meta-analyses, as well as scientific and policy summary statements.*

***Key words***: *physical activity, health, cardiovascular diseases, heart rate.*

***Language***: *English*

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## Introduction

Physical activity (PA) refers to any body movement produced by skeletal muscles that requires energy expenditure and is an essential means of promoting physical and mental health. Physical activity reduces the risk of many non-communicable diseases and benefits the community by strengthening social interaction and increasing people's involvement in their local community. PA is not only a public health issue. It also contributes to the well-being of local communities, protects the environment, and is an investment in future generations.

PA plays a crucial role in the prevention and treatment of cardiovascular disease. The human body evolved to be physically active, yet much routine bodily movement has been removed from our daily lives. This has been associated with many aspects of poor health. Industrialization, urbanization and mechanized transport have reduced physical activity, even in developing countries, so that currently more than 60% of the global population are not sufficiently active. Physical exercise is linked to longevity, independently of genetic factors. Physical activity, even at an older age, can significantly reduce the risk of coronary heart disease, diabetes, high blood pressure, and obesity, help reduce stress, anxiety and depression, and improve lipid profile. It also reduces the risks of colon cancer, breast cancer and ischemic stroke. Doing more than 150 minutes of moderate physical activity or 60 minutes of vigorous physical activity a week – whether at work, in the home, or elsewhere – can reduce the risk of coronary heart disease by approximately 30% (WHO 2008).

Both regular PA and higher levels of cardiorespiratory fitness (CRF) are associated with a reduced risk of developing hypertension, type 2 diabetes mellitus, atrial fibrillation, chronic kidney disease, heart failure, and cardiovascular events. Each 1-MET increase in exercise capacity is associated with a ~15% reduction in mortality in patients with and without cardiovascular disease. Indeed, a recent landmark study reported that the most physically active cohorts of men and women demonstrated 7- to 8-year gains in life expectancy (Li et al., 2018). Increased levels of habitual PA prior to hospitalization for acute coronary syndromes are also associated with better short-term cardiovascular outcomes. In contrast, individuals with low CRF have higher annual

health care costs, higher rates of surgical complications, and are more likely to die prematurely than their matched counterparts.

Cardiovascular disease (CVD) is the leading cause of morbidity and mortality worldwide: more people die annually from CVDs than from any other cause. An estimated 17.9 million people died from CVDs in 2016, representing 31% of all global deaths. Of these deaths, 85% are due to heart attack and stroke. Over three quarters of CVD deaths take place in low- and middle-income countries. Out of the 17 million premature deaths (under the age of 70) due to noncommunicable diseases in 2015, 82% are in low- and middle-income countries, and 37% are caused by CVDs. Most cardiovascular diseases can be prevented by addressing behavioural risk factors such as tobacco use, unhealthy diet and obesity, physical inactivity and harmful use of alcohol using population-wide strategies. People with cardiovascular disease or who are at high cardiovascular risk (due to the presence of one or more risk factors such as hypertension, diabetes, hyperlipidaemia or already established disease) need early detection and management using counselling and medicines, as appropriate (WHO 2017).

**Literature review**

The term "physical activity" should not be confused with "exercise," a subspecies of physical activity. Physical activity is a planned, structured, repetitive activity designed to improve or maintain one or more components of fitness. In addition to exercise, physical activity also includes other types of active movements performed during play, work, active movement, housework, and recreation.

**The following physical activities have similar benefits to health:**


**Pictute 1.**

*Source: https://www.who.int/cardiovascular_diseases/en/cvd_atlas_08_physical_inactivity.pdf*

Physical inactivity is associated with many of the leading causes of death, chronic morbidity and disability. The apparent protective effect of being more active, and consequently less inactive, was identified first through studies of occupational activity over 50 years ago. Subsequent research has investigated different types, duration, frequency and intensity of activity in association with various cardiovascular, musculoskeletal and mental health outcomes. Today, there is a significant amount of literature quantifying and qualifying the role of physical inactivity as a risk factor and worldwide interest and efforts to increase levels of participation (Ezzati et al., 2004).

It is known that regular physical activity (PA) reduces the risk of premature death, cardiovascular disease, hypertension, type 2 diabetes, breast and colon cancer, as well as depression and falls in old age (Nocon et al., 2008). Its main effect, however, is to reduce the risk of cardiovascular events. The PURE prospective cohort study with 168,916 participants showed that greater physical activity was associated with a lower risk of cardiovascular disease and premature death in high-, middle-, and low-income countries.

PA was classified as low at less than 600 MET-minutes (<150 minutes of moderate-intensity physical activity per week), medium at 600-3000 MET-minutes (150-750 minutes of physical activity per week), and high activity at more than 3000 MET-minutes (>750 minutes of physical activity per week). There were 5334 deaths (1294 cardiovascular deaths and 4040 non-cardiovascular deaths) over 6.9 years. When stratified by physical activity, with an increase in activity from low to moderate to high for all outcomes except cardiac deaths, there was a gradual decrease in frequency of occurrence by age and sex.

Participants who followed the physical activity guidelines had lower rates of all outcomes based on age and sex (Lear et al., 2017). A direct correlation between endothelial dysfunction and the development of cardiovascular risk factors has been proven. Improved parameters of endothelial function, oxidative stress and autonomic function may be an explanation for the beneficial effect of exercise (Millar et al., 2013).

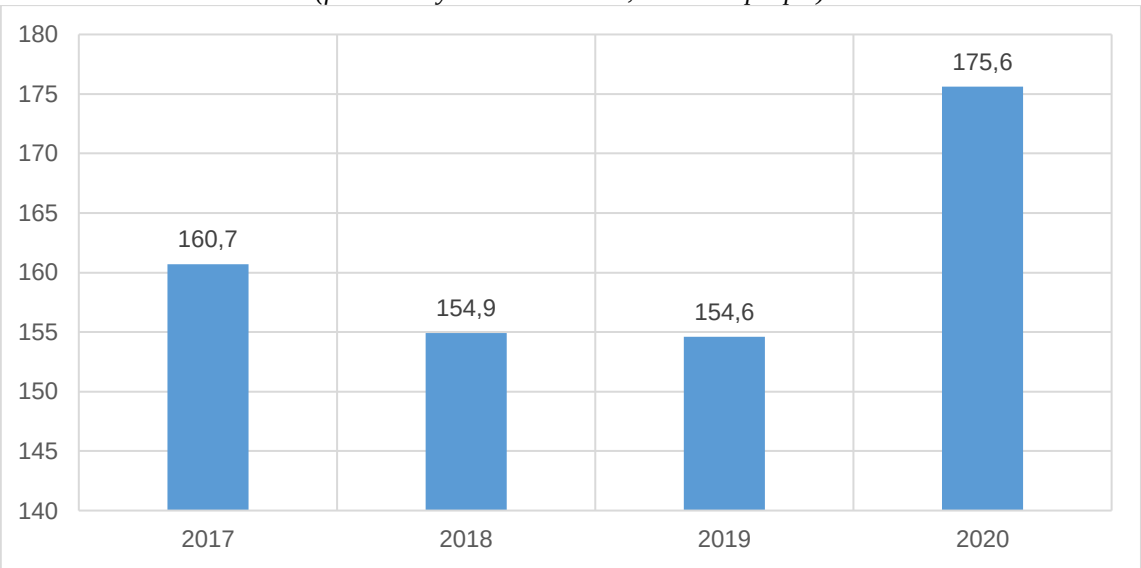
The main question to answer is: can heart rate (HR) be considered as an independent risk factor for cardiovascular complications or is it a marker of cardiovascular de-training?

HR is determined by the activity of autonomic nervous system, the content of circulating hormones in blood and the training of cardiovascular system, which directly depends on the level of physical activity (Verrier 2009, Jensen 2012). Given the known relationship between high physical fitness and low HR (Millar et al., 2013), low FA may be an important aggravating factor with regard to cardiovascular event risk. This is confirmed in a prospective cohort study conducted in Copenhagen (Jensen et al., 2013). The study investigated the significance of elevated resting heart rate in middle-aged men. FA was assessed by cycle ergometry. The result of this study was the conclusion that heart rate is a risk factor for death regardless of physical fitness and other potential risk factors. A high level of physical fitness serves as a strong predictor of longevity (Millar et al., 2013), which is also due to the positive effect on bone mineral density (Herbert et al., 2018. In the Paris study, resting HR was a predictor of death, and especially sudden death, taking into account the duration of physical activity (Jouven et al., 2005). However, the main part of the study included subjective estimation of FA level, and in some cases this information was not assessed. In the Copenhagen study, all participants had their oxygenation determined and their FA assessed at leisure time. It was found that people with low FA at high resting HR had a worse prognosis than those with low HR. One might suggest that high resting HR is not a marker of low FA but an additional risk of cardiovascular of cardiovascular complications (Jensen et al., 2013).

**Nutrition, physical activity and obesity in Uzbekistan**

Intercountry comparable overweight and obesity estimates from 2008 (WHO 2013) show that 44.2% of the adult population (> 20 years old) in Uzbekistan were overweight and 15.1% were obese. The prevalence of overweight was higher among men (45.1%) than women (43.4%). The proportion of men and women that were obese was 12.8% and 17.4%, respectively. Adulthood obesity prevalence forecasts (2010–2030) predict that in 2020, 13% of men and 20% of women will be obese. By 2030, the model predicts that 14% of men and 25% of women will be obese. The number of deaths in January-December 2020 amounted to 175.6 thousand people and, compared to the same period of 2019 (154.6 thousand people), increased by 21.0 thousand people (Figure 1).

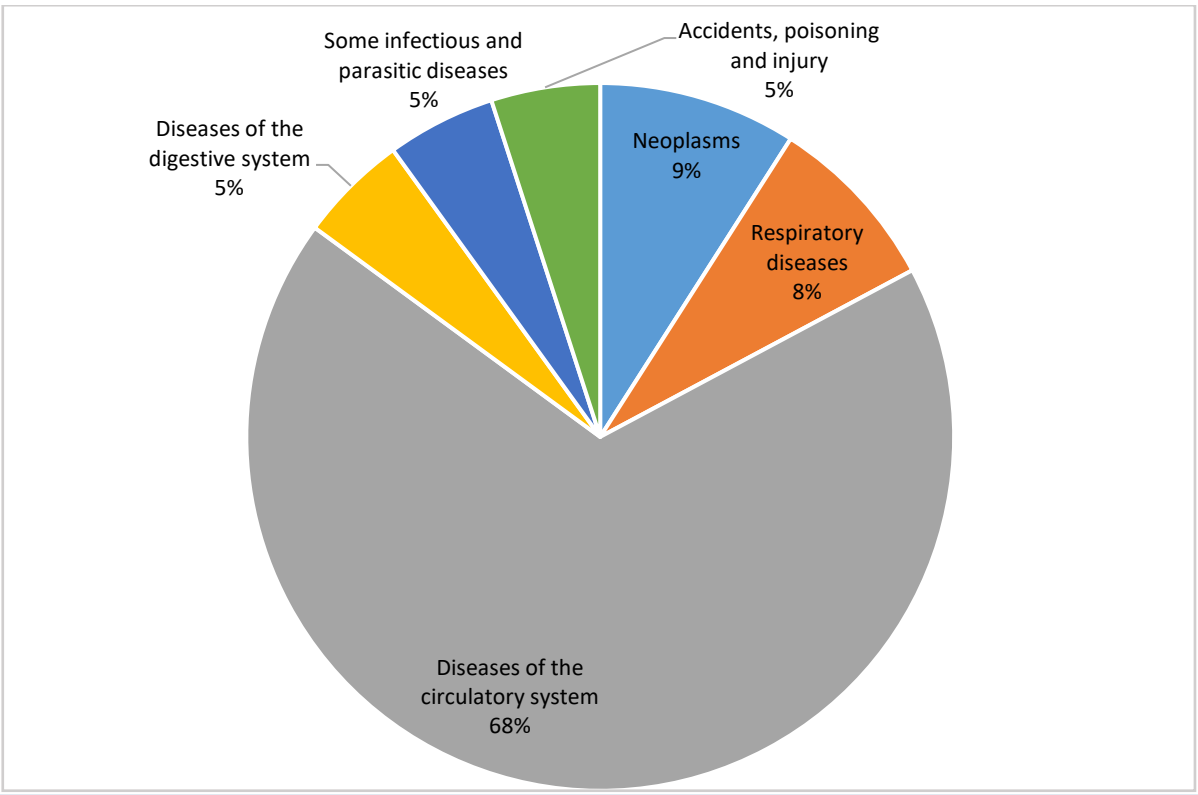
**Figure 1. The number of deaths in the Republic of Uzbekistan**
*(for January-December 2020, thousand people)*




*Source: Quarterly reports of The State Committee of the Republic of Uzbekistan on Statistics https://stat.uz/en/quarterly-reports/5868-2020#january-december*

In the structure of total mortality, 60.0% are diseases of the circulatory system, 8.0% are neoplasms, 7.2% are diseases of the respiratory system, 4.4% are diseases of the digestive system, 4.4% are accidents, poisoning and injuries, 4.4% - infectious and parasitic diseases and 11.6% - other diseases. (Figure 2)

**Figure 2. Distribution of deaths by major causes of death**
*(for January-December 2020, in relation to the total number of deaths,%)*




*Source: Quarterly reports of The State Committee of The Republic of Uzbekistan on Statistics https://stat.uz/en/quarterly-reports/5868-2020#january-december*

**What Are the Benefits of Exercise?**

A sedentary lifestyle is one of the 5 major risk factors (along with high blood pressure, abnormal values for blood lipids, smoking, and obesity) for cardiovascular disease, as outlined by the American Heart Association (Pate et al., 1995). Evidence from many scientific studies shows that reducing these risk factors decreases the chance of having a heart attack or experiencing another cardiac event, such as a stroke, and reduces the possibility of needing a coronary revascularization procedure (bypass surgery or coronary angioplasty). Regular exercise has a favorable effect on many of the established risk factors for cardiovascular disease. For example, exercise promotes weight reduction and can help reduce blood pressure. Exercise can reduce "bad" cholesterol levels in the blood (the low-density lipoprotein [LDL] level), as well as total cholesterol, and can raise the "good" cholesterol (the high-density lipoprotein level [HDL]). In diabetic patients, regular activity favorably affects the body's ability to use insulin to control glucose levels in the blood. Although the effect of an exercise program on any single risk factor may generally be small, the effect of continued, moderate exercise on overall cardiovascular risk, when combined with other lifestyle modifications (such as proper nutrition, smoking cessation, and medication use), can be dramatic (Figure 3).

**Figure 3. Benefits of Regular Exercise on Cardiovascular Risk Factors**


*Source: Myers, J. (2003). Exercise and Cardiovascular Health. Circulation, 107(1).*

There are a number of physiological benefits of exercise; 2 examples are improvements in muscular function and strength and improvement in the body's ability to take in and use oxygen (maximal oxygen consumption or aerobic capacity). As one's ability to transport and use oxygen improves, regular daily activities can be performed with less fatigue. This is particularly important for patients with cardiovascular

disease, whose exercise capacity is typically lower than that of healthy individuals. There is also evidence that exercise training improves the capacity of the blood vessels to dilate in response to exercise or hormones, consistent with better vascular wall function and an improved ability to provide oxygen to the muscles during exercise. Studies measuring muscular strength and flexibility before and after exercise programs suggest that there are improvements in bone health and ability to perform daily activities, as well as a lower likelihood of developing back pain and of disability, particularly in older age groups (Myers 2003).

**Conclusion**

Physical activity, and especially systematic exercise, prevents or inhibits the development and progression of coronary heart disease and stroke, as well as other cardiovascular diseases, through many scientifically proven biological mechanisms. It is not known exactly which aspects of physical activity lead to optimal preventive effects. However, it is safe to say that, in general, the amount, intensity, frequency, type, and nature of physical activity consistent with current recommendations is necessary and sufficient to produce most of the potential benefits of most of these mechanisms. Moreover, it is clear that people who are (or have been) less physically active will benefit more from low amounts of physical activity.

There is strong epidemiological evidence for the beneficial effects of regular exercise that goes far beyond reducing the risk of cardiovascular disease. In addition, exercise combines preventive, multisystem effects, high availability, and low cost. Physical activity, and especially strength training, is a source of substances with therapeutic effects produced by the body itself. Regular physical activity has beneficial effects on homeostasis, tissue function and interaction. In contrast to exercise, no drug intervention has proven effective in maintaining muscle fitness, a key factor in high quality of life at all stages of life. Assessing the body's adaptation to exercise helps improve our understanding of the pathophysiology of chronic disease, changing old views and facilitating the exploration of new therapeutic approaches.

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