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PHYSICAL INACTIVITY – THE HUMAN HEALTH'S GREATEST ENEMY

GIBALNA NEAKTIVNOST – NAJHUJŠI SOVRAŽNIK ČLOVEKOVEGA ZDRAVJA

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ABSTRACT

For decades, research has been highlighting the positive impact of physical activity on health. Despite the immense efforts made by many professional and scientific organizations to raise individual and societal awareness about the role of a sufficient quantity and intensity of physical activity in everyday life and to increase the level of adherence, the situation is still very worrying. Even more worrying is the fact that increasingly prolonged periods of physical inactivity are insidiously and aggressively taking over modern people's lives – at school, at work, at home, even at leisure. It is probably incomprehensible and difficult for many to accept, but physical inactivity is becoming the first and worst enemy of health in today's society.

Keywords:
contemporary society, sedentary behaviour, physical inactivity, health

IZVLEČEK

Raziskave že več destletij izpostavljajo pozitiven vpliv gibalne aktivnosti na zdravje. Kljub neizmernemu prizadevanju številnih strokovnih in znanstvenih organizacij v zadnjih desetletjih, da bi posamezniku in družbi ozavestili vlogo o pomenu ustrezne količine in intenzivnosti gibalne aktivnosti v vsakdanu človeka ter dvignila stopnjo adherence, je stanje še vedno zelo zaskrbljujoče. Še bolj pa nas mora skrbeti dejstvo, da vse daljša obdobja gibalne neaktivnosti prikrito in agresivno prevzemajo življenje sodobnega človeka – v šoli, na delovnem mestu, v prostem času, doma. Za marsikoga verjetno nerazumljivo in težko sprejemljivo, pa vendar se gibalna neaktivnost spreminja v prvega in najhujšega sovražnika zdravja v današnji družbi.

Ključne besede:
sodobna družba, sedeč način življenja, gibalna neaktivnost, zdravje

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1 INTRODUCTION

Physical activity (PA) is more important for our health than ever. It is a lever for physical fitness, working efficiency, immune system resilience, and maintenance of psychophysical balance. PA is, naturally, central to evolution; however, evolution is being undermined by a new relationship with gravity, from opposing to acceding. Will we survive this devolution?

PA restrictions associated with COVID-19 and high exposure to hypokinetic conditions is a phenomenon of the sedentary lifestyle we have been witnessing for at least the last two decades. In-home lockdowns and school and playground closures are only a few restrictions imposed by governments. They all greatly affect PA patterns. And indeed, a ~50% decrease in moderate and vigorous PA (MVPA) with an additional ~50% of increased physical inactivity (PI) have been reported (1, 2), leading to the most sedentary period in human history. A "sociology of sedentarism"(3) is emerging to study this new phenomenon.

The purpose of this paper is to outline the consequences of PI studied through more aggressive models (BR case) or restriction periods (COVID-19) as well as to explain the effects of PA and its dimensions in order to counteract these negative effects.

2 PHYSICAL INACTIVITY – ACUTE EFFECTS OF SHORT EXPOSURE TO COMPLETE INACTIVITY

In young adults PI leads to remodulation of motor units and the mechanisms of muscle deterioration, as shown in bed rest (BR) studies. The deterioration is very intense after just a few days of PI (4, 5). Sudden exercise cessation has been associated with rapid onset of insulin resistance (6, 7) in muscle tissue, decreased muscle glucose utilization, and muscle protein degradation with consequent muscle atrophy (8). Loss of muscle structure and function (9, 10) and increases in insulin resistance accelerate, the risk of developing mechanisms which lead to T2D. Inactivity-related factors (11) also contribute to reduction in cardiorespiratory fitness, bone mineral content, and physical function. PI is particularly deleterious in certain patient populations, such as those at high risk of T2D (12), cardiovascular disease (13), cancer, (14) osteoporosis, and mental health (15) and in the elderly, considering concomitant sarcopenia or osteoporosis.

Numerous BR studies demonstrate that the consequences of PI on physical and mental health are severe, and the mechanisms of deterioration of certain body systems very rapid. Circumstances are exacerbated when PI is coupled with ageing or comorbidities. PI has a negative impact on most subsystems of the human body, among which negative consequences were reported on:

- muscle mass and architecture (9, 16–18);
- muscle function (18, 19);
- bones (20, 21);
- metabolic balance (9, 22)
- cellular oxidative metabolism (23, 24)
- neural processing efficiency (25) and cognitive functions (26-28)
- cardiovascular and respiratory functions (29, 30)

The negative effect of hospitalization on patients' health could be partly explained by disease-related problems, but also by the sudden reduction in PA. We are challenged by the clinically important question regarding overcoming the disease and simultaneously preventing secondary consequences of disuse (31). Where is the line between necessary rest and unnecessary loss? Rest or PI is often inappropriately, overly, or unjustifiably prescribed for certain injuries and illnesses.

3 PHYSICAL INACTIVITY FOR LONG PERIODS AND THE COVID-19 EXPERIENCE

As more governments tighten quarantine or consider various forms of lock-down to prevent the spread of COVID-19 (32), a major concern arises regarding the potential negative impact of PI due to personal limitations (13). The consequences of COVID-19 restrictions are like those at post-complete PI. Subjects included in the BR study after 2 months of lockdown show a comparable increase in insulin resistance. Lockdown led to about a 75% decrease in daily step count, with concomitant ill effects (e.g. weight gain).

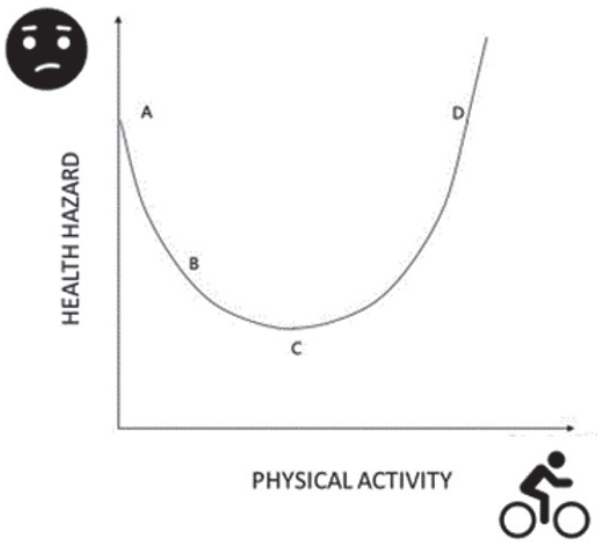
We have conducted several studies during COVID-19 restrictions. Although even before the pandemic, most adults failed to meet the minimum daily recommendations, we noted an additional 40% decrease of MVPA, a 40% decrease in walking time, and a 30% increase of PI (33). Focusing on the prevalent PI, we soon discovered that the highest increase occurred in the amount of sitting time, and within that of screen time (by as much as 60%), which was related to weight gain (2). Before the pandemic as many as 80% of children were involved in organized sports activities; now around 90% of children do not/cannot engage in them. The SLO fit study (34) revealed a striking deterioration of motor skills and physical characteristics of children in Slovenia, recording the lowest levels in the history of such monitoring.

Consistently meeting PA guidelines was strongly associated with a reduced risk for severe COVID-19 outcomes among infected adults. Patients with COVID-19 who were consistently inactive had a greater risk of hospitalization, admission to the ICU or death than patients who consistently met PA guidelines (35).

4 RELATIONSHIP BETWEEN PHYSICAL ACTIVITY, PHYSICAL INACTIVITY, AND HEALTH

Over three decades ago, the WHO issued recommendations for sufficient exercise, noting the correlation between regular physical exercise and health. Given that the most recent global estimates (36) show that one in four (27.5%) adults and more than three-quarters (81%) (37) of adolescents fail to meet the recommendations for aerobic exercise, there is an urgent need to increase PA.

Exercise is, in terms of amount and intensity, correlated with health risk factors according to the U-shaped curve model (Figure 1).



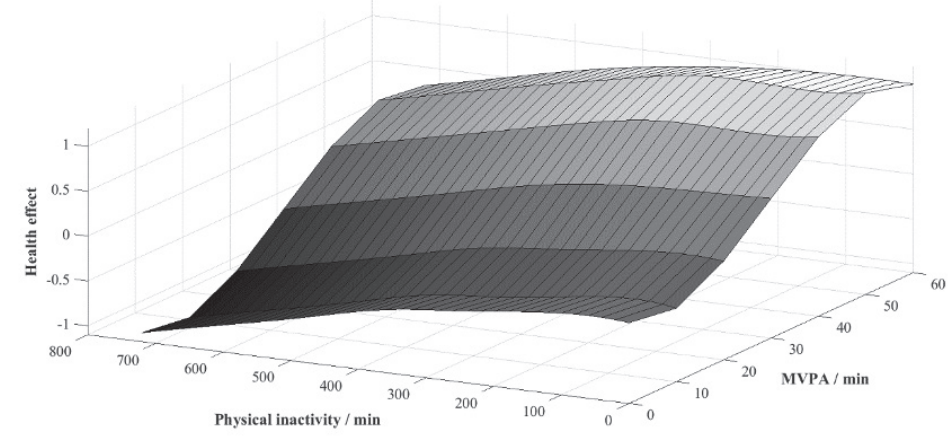
Legend: A – 0 to LPA (low PA); B – MPA (moderate PA); C – MVPA (moderate-to-vigorous); D – VPA – OVERUSE/INJURY (vigorous-to-overuse)

Figure 1. Correlation between amount and intensity of exercise and health hazard.

Lack of PA (A) is a very strong health risk factor. Moderate-to-vigorous PA (MVPA) represents the ideal ratio and stimulates the mechanisms for preserving metabolic and cardiovascular health, while very vigorous PA can even be harmful, particularly due to strain and musculoskeletal injuries.

The worst threat to health remains PI, which shows little interdependence with MVPA. We are witnessing increasingly long periods of PI in both active and inactive populations. A recent study (38) of young college athletes and their inactive peers highlighted a very interesting phenomenon, finding that there is no difference in mean sitting time (10.96±2.98 hours) between athletes and non-athletes. Because of the independent relationship between MVPA time and sitting time, athletes can be highly active and highly sedentary at the same time, so that there is a harmful net effect on their health. The meta-analysis (39) conducted to estimate the pooled mean of time spent in PA and sedentary time concluded that interventions delivered during childcare and school might produce better results if they focus on reducing PI/sedentary time, rather than promoting PA.

Studies indicate that safe and responsible health-related behaviour is that which makes sure we are sufficiently physically active every day and sedentary as little as possible (Figure 2): between 40 and 60 min of MVPA daily, when we are not physically inactive (sedentary) for more than 4 hours in total and these periods of inactivity do not last more than 40 minutes at a time.



Legend: Physical inactivity min/day; MVPA – moderate-to-vigorous physical activity min/day

Figure 2. Schematic representation of physical inactivity and MVPA effecting our health.

5 CONCLUSION

Sedentary behaviour is associated with the early onset of noncommunicable chronic diseases that lead to health problems and to all-cause mortality, regardless of other risk factors. Although PI progresses to the second risk factor of overall mortality – in 2006 it was the 7th (40) – it should be noted that it is the most easily modifiable health factor in all age groups. As a "silent killer", its effects may go undetected for years or decades before a preventable disease develops from it.

Many scientific publications consider PI a pandemic, supporting the publication of the WHO Global Plan of Action for Physical Activity 2018–2030 (37). This document aims to provoke a relative reduction in PI of 10% by 2025 and of 15% by 2030, which will contribute to longer life expectancy and a higher quality of life. Ensuring sufficient, high-quality PA must be addressed separately from reducing PI in the most vulnerable subgroups. PA and PI are two separate and weakly correlated phenotypes, they may include the same or completely different groups of individuals, with the need for various interventions and tools.

The goal is to achieve less than 4 sitting hours a day, in shorter periods, and at least 1 hour of MVPA. Do we need restrictions to limit sedentary behaviour? Do we need to introduce taxes on unnecessary sitting hours for inactive healthy people, on the use of elevators, limit time in front of screens, etc.? It would probably be easier than waiting for general awareness of the positive effects of PA to emerge.

CONFLICTS OF INTEREST

The author declares no conflicts of interest.

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ETHICAL APPROVAL

Ethical approval for this editorial is not needed.

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