

Physical Activity for Promoting Cardiovascular Health: Move More, Move Harder, Sit Less

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ABSTRACT

Physical activity is crucial for heart health and disease prevention, but sedentary behaviour remains a global concern. This review investigates the significance of physical activity in reducing cardiovascular mortality and enhancing overall well-being across diverse populations. Analyzing current literature highlights the various benefits of physical activity, including its role in lowering the risk of all-cause mortality, cardiovascular diseases, and obesity while improving quality of life. Flexible exercise patterns and daily step counts offer incremental health advantages, emphasizing the importance of maintaining an active lifestyle. Strategies targeting sarcopenia through aerobic exercise highlight the requirement of preserving muscle mass and function, particularly in older adults. Moreover, utilizing data for policy interventions shows promise in boosting physical activity levels, especially in urban settings of low- and middle-income countries, though challenges persist in evaluating policy impact. Embracing evidence-based physical activity interventions and policy measures is vital for reducing sedentary behaviour, promoting physical activity, and addressing the global burden of chronic diseases, ultimately fostering population health and well-being.

Key-words: Sedentary behaviour, cardiovascular diseases, global health, metabolic syndrome, non-communicable diseases, walking.

Key Messages: Physical activity that will improve your cardiovascular fitness.

Introduction

The World Health Organization (WHO) defines physical activity “as any bodily movement produced by skeletal muscles that requires energy expenditure” 1. Regular physical activity is important not only for the prevention of ischemic heart disease but also for growth, and development, to increase general well-being, and to provide substantial health advantages, by reducing the likelihood of various chronic illnesses (Table 1) 2. Doing some activity has more significant health benefits than doing nothing. One should try to move more, move harder, and sit less, as every minute of activity counts and contributes to incremental health benefits.

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Table- 1: Health benefits of physical activity

- Reduce risk of all-cause mortality
- Reduce risk of cardiovascular disease mortality
- Reduce risk of cardiovascular disease (including heart disease and stroke)
- Reduce risk of hypertension
- Reduce risk of type 2 diabetes
- Reduce risk of adverse blood lipid profile
- Reduce risk of cancers of the bladder, breast, colon, endometrium, oesophagus, kidney, lung, and stomach.
- Improved cognition
- Reduce risk of dementia (including Alzheimer's disease)
- Improved quality of life
- Lower anxiety
- Lower risk of depression
- Improved sleep
- Reduced weight gain
- Weight loss
- Improved bone health
- Improved physical function
- Reduced risk of falls (older adults)
- Reduced risk of fall-related injuries (older adults)

Methodology

Protocol and registration.

We did not publish and register the protocol for the scoping review in advance.

Literature Search

For literature search, a comprehensive search strategy using varied combinations of key words was used. Literature search was performed systematically using two electronic databases including PubMed and Google Scholar. Extraction of suitable articles was carried out from the year 2017 onwards. List of bibliographies of all included articles was also screened to identify the relevant articles.

Sedentary Behavior and Cardiovascular Health

Sedentary behaviour is defined as any awake activity resulting in energy expenditure less than or equal to 1.5 metabolic equivalent while sitting, reclining or lying¹. Reading a book, watching television, and playing video games are classic examples. A sedentary person is some one who exceeds 4 hours of sedentary behaviours, as beyond this cut-off level, the risk of cardiovascular diseases or a cardiovascular event start to increase.² Increased sedentary behaviour (sitting time) is associated with a higher risk of all-cause and cardiovascular mortality.² This also increases obesity, type-2 diabetes, hypertension, metabolic syndrome and dyslipidaemia³. Currently, sedentary behaviour is a major global health

problem. Since 2002, there has been a steady increase in sedentary behaviour in Europe, reaching 45,8% in 2017.⁴ According to a recent Spanish study, about 40% of women and 32% of men reported being sedentary in their leisure time, not doing any physical activity but spending time sitting, reading and watching television.⁵

About one-third of the world's population above the age of 15 years have insufficient physical activity, which contributes to the death of about 3.2 million people every year.⁶ About half the people in USA (55%) and about 40% of Europeans spend their leisure time in sedentary behaviours (2.7 hours a day).⁷

Physical inactivity is (not achieving the recommended guidelines) is a major health problem and a modifiable cause of increased cardiovascular and all-cause mortality. In 2008, physical inactivity contributed to about 6% to 10% of the world's major chronic non-communicable diseases and 9% of premature mortality.⁸ We generally spend about 7.7 hours per day in sedentary behaviours.⁹

Recommended physical activity

Significant (30%), all cause and cardiovascular, mortality benefits can be achieved by 150-300 minutes (7.5-15 meters/week) of moderate-intensity aerobic exercise or 75-150 minutes of vigorous-intensity aerobic exercise or an equivalent combination of both every week¹⁰. Moderate intensity activities are defined as activities that make one breathless and still able to converse during the activity. These include brisk walking, non-competitive swimming, and normal cycling. Vigorous-intensity activities make one breathless enough that speaking more than a few words without stopping the activity is difficult. Most moderate intensity activities become vigorous with increasing effort. Some examples include running, swimming, cycling at high speed or uphill, climbing stairs, and playing sports such as football, rugby, netball, and hockey.¹⁰

Additionally, it is recommended to do muscle-strengthening activities of moderate or greater intensity involving all the muscle groups of the body for two days or more each week. This can be done on the same day or on different days of the physical activity. These exercises include exercises using one's body weight (e.g., push-ups), weightlifting, resistance elastic bands, and daily activities such as heavy gardening, carrying children, shopping, washing clothes, climbing stairs and Yoga. Combination of both physical activity and muscle-strengthening activities, according to 2018 physical activity guidelines¹¹, provide increased advantages than doing physical activity alone. Those who do both get 40% reduction in the risk of all-cause mortality and those who performed either of the activities had a 29% and 11% lower risk of dying from all causes, respectively.¹¹

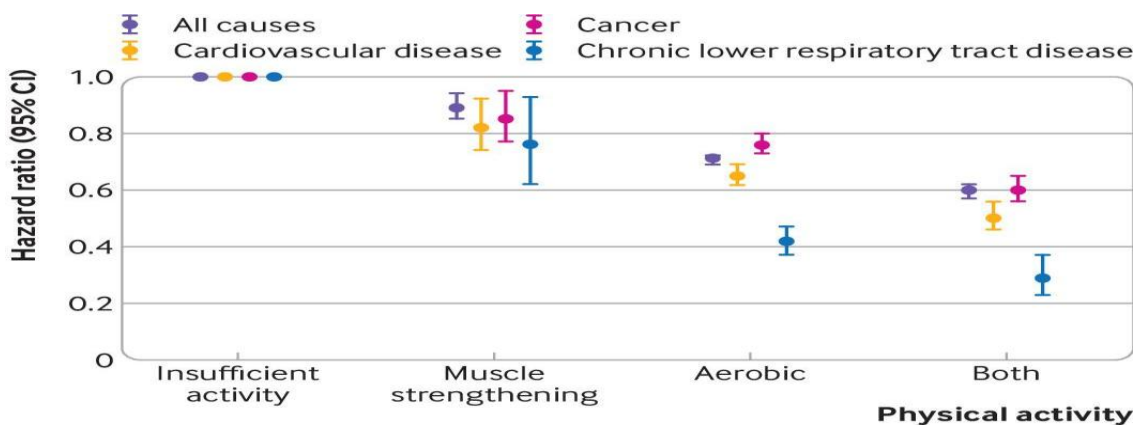


Figure- 1¹¹

If one cannot achieve the recommended activity levels, doing some physical activity is more beneficial than doing nothing to achieve at least a 20% mortality reduction.¹²

According to the most recent global estimates, around 1.4 billion adults, which accounts for 27.5% of the world's adult population, fail to achieve the minimum recommended physical activity level.¹³

Regular moderate to vigorous physical activity equivalent to current recommended levels can minimize or even eliminate the association between sitting time (sedentary behaviour) and the risk of all-cause and cardiovascular disease mortality². Converting sitting to walking and doing some physical activity has been shown to reduce this risk. Reducing sedentary behaviour (sitting time) and increasing physical activity are key strategies to keep healthy in physically inactive people.

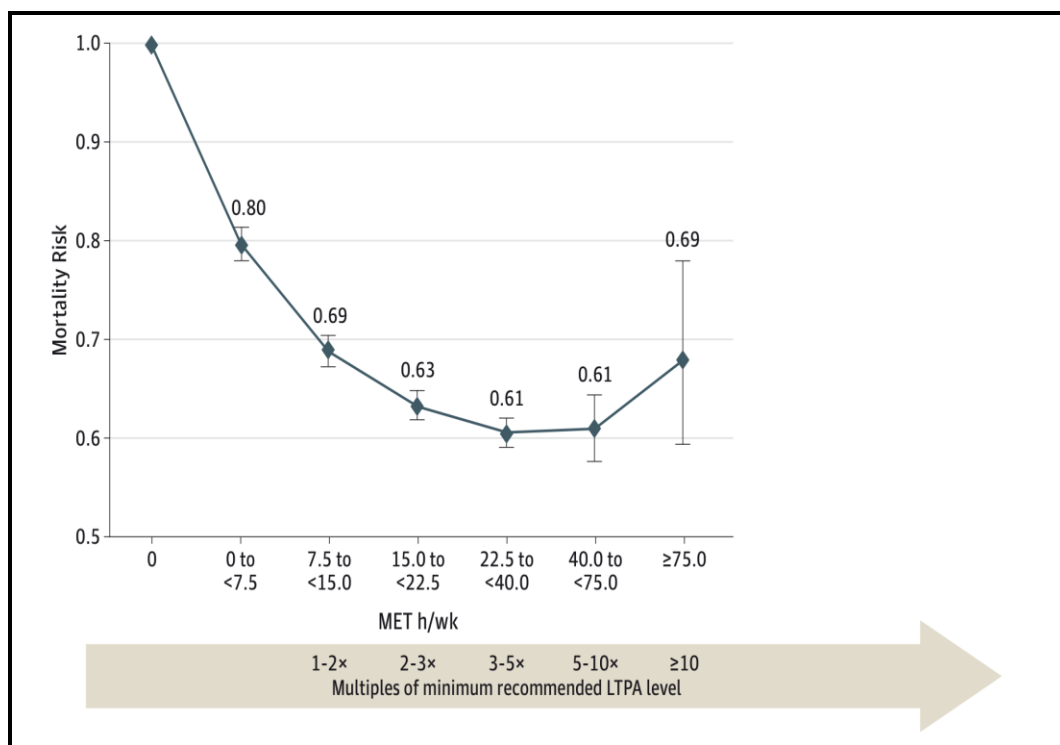


Figure- 2¹²

Regular physical activity shows a dose-response relationship with mortality risk, where even a small increase in activity levels for sedentary individuals leads to a significant decrease in mortality. Moreover, as physical activity levels increase beyond recommended guidelines, the benefits continue to rise, resulting in a greater reduction in mortality upto certain activity levels (75 MET). Beyond this there is a slight risk in mortality for physical activity beyond 75 MET h/wk.¹⁴ All sedentary individuals therefore should start moving slowly as every move counts and gradually build up the intensity and duration to reach the desired goals. Implementing this simple measure could lead to a significant reduction in healthcare costs.

There has been a recent conflicting hypothesis that extremely high physical activity, like endurance training, is associated with high coronary artery calcium (CAC) scores resulting in increased mortality. However, there is no significant evidence to this effect¹⁵.

On the contrary, there is a reduction in all-cause and cardiovascular mortality, probably explained by these increased CAC scores reflecting an increased calcified stable plaque load leading to reduction in coronary events.

Benefits of flexible physical activity patterns

Physical exercise does not have to be evenly distributed over the week. Active persons, whether infrequent or regular in their physical activity pattern, had similar decreased all-cause mortality rates. Studies show no significant differences in mortality rates between weekend warriors and regularly active individuals as long as the recommended weekly physical activity levels were achieved in fewer, more intense sessions, on weekends or holidays than in regular sessions.¹⁶ This information is a beneficial to those who are busy during weekdays and only get to exercise during the weekend.

Physical activity can be performed any time of the day. A cohort study of 92,139 UK Biobank participants reveals that moderate-to-vigorous intensity physical activity (MVPA) at any time of day is associated with lower risks of all-cause, cardiovascular disease, and cancer mortality. Midday-afternoon and mixed timing groups exhibit lower risks of mortality compared to morning PA group, specially among the elderly, males, less physically active individuals, or those with preexisting cardiovascular diseases.¹⁷ Despite recommended amounts of physical activity, any amount has some benefits, ranging from short term to long term outcomes.¹⁸

Effectiveness of Daily Step Counts on Health Outcomes

Walking is the most common and easiest way to encourage physical activity as it needs no specialised training and can be done anywhere at any time. Walking has been shown to reduce the risk of all-cause mortality and cardiovascular diseases. Some countries are implementing a general recommendation to take 10,000 steps daily as a national public health goal¹⁹, but there is no real evidence to support this recommendation.

With the availability of wearable devices such as accelerometers, smart watches, and smart phones it has become easy to count the steps daily. Measuring daily step counts is a popular way of interpreting people's daily activities in terms of health benefits. Earlier WHO guidelines (2010) recommended a continuous minimum of 10 minutes of walking for health benefits. However subsequently has been changed to every step counts towards the additive benefit, and no minimum duration of continuous walking is required. The benefits are seen incrementally, starting with low step counts and increasing every 2000 steps and keep increasing significantly with higher step counts. Cardiovascular event rates are estimated to drop by 10% for every 2000 steps taken per day in increments up to 10,000 steps.²⁰

Evidence show that walking approximately 9000 steps per day reduced all-cause mortality by about 40% when compared with 4000 steps per day, and walking 9500 steps per day reduced cardiovascular events by 35% when compared with walking 3500 steps²¹.

Increasing the daily number of steps, progressively decreases mortality. This incremental benefit has been shown to reach a plateau at around 6000–8000 steps per day for adults aged 60 or more and about 8000–10,000 for younger adults¹¹. This mirrors the relationship observed between physical activity and mortality²². After accounting for the overall number of steps taken per day, no significant association was found between step intensity (number of steps per minute) and the risk of all-cause mortality.²³

Mitigating Sarcopenia: The Role of Physical Activity

Sarcopenia is characterized by an accelerated loss of muscle mass and function, and physical performance. Sarcopenia is associated with rapid progression of cardiovascular diseases and higher risk of mortality²⁴. This affects approximately 10% of older adults. Although sedentary behaviour and light physical activity have minimal associations

with Sarcopenia in older people, moderate-to-vigorous physical activity appears protective against sarcopenia.²⁵ Regular aerobic exercise, irrespective of the specific approach and intensity, primarily improves cardio-respiratory fitness in older adults and in reducing risk of sarcopenia.²⁶

Strategies to improve physical activity levels in low and middle income countries

In a systematic review examining interventions to increase physical activity in urban settings of low- and middle-income countries (LMICs) recreational space interventions, such as green spaces in the form of playgrounds, schoolyards and public plazas, were most common, followed by health promotion, neighborhood (building gardens, fountains and benches so community can gather)²⁷, and transportation interventions (improving public transport and non-motorised transport such as building bicycle pathways)²⁸. Overall, 9 out of 12 interventions were significantly associated with increased physical activity levels across LMICs, suggesting their potential applicability for policymakers in similar contexts²⁹. Another study found some policies, like those focused on schools and infrastructure, showed clear effectiveness, while evidence for others, especially economic policies, was lacking.³⁰ Overall, the available evidence offers some guidance for policymakers, there are also challenges in understanding the impact of physical activity due to policies.

Physical activity promotion can begin with mass media campaigns and go up to community scale changes in infrastructure³¹. Thus showing that interventions are also possible with limited funds

Conclusion

Physical activity is a cornerstone of health promotion and disease prevention, offering a range of benefits from reducing the risk of several chronic and cardiovascular diseases to improving overall well-being and longevity. These sedentary behaviors poses a significant health risk and contributes to the global burden of disease, highlighting the importance of reducing sitting time and promoting regular physical activity across all age groups. Flexible exercise patterns and the effectiveness of daily walking monitors by step counts further stresses the adaptability and accessibility of physical activity interventions in improving health outcomes. Reducing sarcopenia and utilizing data for policy interventions present additional avenues for promoting physical activity and addressing public health challenges. By following evidence-based recommendations and implementing targeted interventions, policymakers, healthcare professionals, and public alike can contribute to a healthier future for populations worldwide.

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