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Integrated study master's thesis

Advising Patients In Physical Activity Related To Patient Disease And Health Status

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Used Abbreviations

CVD: Cardiovascular disease
CAD: Coronary artery disease
PCI: percutaneous coronary intervention
GLUT4: glucose transporter 4
T2D: Type 2 diabetes
T1D: Type 1 diabetes
HIIT: high-intensity interval training
IR: insulin resistance
CRF: cardiorespiratory fitness

Key words
The thesis explores how physical activity can be effectively integrated into patient care to improve outcomes in cardiovascular disease, diabetes, metabolic syndrome, and mental health conditions. It focuses on the preventive and therapeutic benefits of exercise, the importance of tailoring activity recommendations to individual patient needs as well as the role of healthcare professionals in overcoming barriers to physical activity. Articles have been used to support the idea that patient focused counseling methods such as motivational interviewing can help patients stick to physical activity and improve their health and lifestyle

Summary
Physical activity is a key factor in preventing and managing many chronic diseases, including cardiovascular conditions, diabetes, metabolic syndrome, and mental health disorders. This thesis explores how healthcare professionals can effectively advise patients on physical activity, using evidence-based strategies tailored to individual health status and needs. The study emphasizes the importance of personalized counseling approaches, such as motivational interviewing, to increase patient motivation, adherence, and long-term engagement in physical activity. It also identifies common barriers—both individual and systemic—that limit physical activity and offers practical strategies to overcome them. By integrating physical activity into routine care, healthcare providers can significantly improve patient outcomes and quality of life.

Content

1. Introduction

1.1 Background and importance of physical activity in health care

Physical activity is one of the main prophylactic methods in preventing several medical diseases especially in relation to cardiovascular diseases and diabetes. For many people physical activity is an important part of their everyday life but on the other hand, its importance is extremely underestimated for some part of the population.
People who are insufficiently active have a 20% to 30% increased risk of earlier death compared to the people who are sufficiently active. Despite the beneficial medical health results, physical activity also contributes to a positive cognitive outcome as well as a healthier mental health.(1)
Many people argue that they do not have enough time for physical activity because of their office work or due to long travel hours, however, the Guidelines on physical activity state that any amount of physical activity is better than none; all physical activity counts for all age groups. But how much do the guidelines recommend for different age groups?

- Children and adolescents (aged 5 – 17 years) should do at least an average of 60 minutes per day of moderate- to vigorous-intensity, mostly aerobic, physical activity, across the week
- Adults (aged 18 – 64 years) should do at least 150 – 300 minutes of moderate-intensity aerobic physical activity or at least 75 – 150 minutes of vigorous-intensity aerobic physical activity. Furthermore, adults should also do muscle-strengthening activities at moderate or greater intensity
- Older adults (aged 65 years and older) should do at least 150 – 300 minutes of moderate-intensity aerobic physical activity or at least 75 – 150 minutes of vigorous-intensity aerobic physical activity. Older adults should also carry out functional balance and strength training on 3 or more days a week (2)

Furthermore, engaging in regular physical activity offers significant mental health benefits, including alleviating symptoms of depression and anxiety. Exercise promotes the release of endorphins (natural mood enhancers) and helps reduce stress levels, contributing to an overall sense of well-being. Additionally, physical activity can improve sleep quality, enhance self-esteem, and boost cognitive function, making individuals more alert and productive throughout the day (3).

Overall, regular physical activity enhances physical function, making daily tasks like household chores, moving around, and getting in and out of bed easier. This increased mobility supports independence and reduces the risk of falls, which is particularly crucial for older adults. Exercise also helps protect against osteoporosis and age-related muscle loss (sarcopenia), improving overall strength and reducing the likelihood of serious fall-related injuries.
Beyond mobility, staying active lowers the risk of chronic diseases common among older adults, including cardiovascular disease, high blood pressure, type 2 diabetes, obesity, and certain cancers. It also helps manage existing health conditions, potentially delaying their progression and improving overall quality of life.
Additionally, physical activity supports mental and emotional well-being. Regular exercise reduces symptoms of depression and anxiety, improves sleep, and enhances cognitive function. Social forms of exercise, such as group activities, provide added mental health benefits through increased social interaction (4).

1.2 Scope and purpose of the study

However, understanding the role of physical activity in modern society and creating awareness in the general population is one of the most important tasks of health and recreation promoters; therefore, there should be enhancements in our knowledge and awareness of physical activity and its impacts on an individual's health. (5)

Therefore, the primary purpose of this study and of advising patients on physical activity is to promote health, prevent disease progression and enhance overall well-being by focusing on the following main objectives:

1. Promoting awareness of the benefits of physical activity
2. Providing disease-specific physical activity recommendations
3. Enhancing patient engagement and adherence
4. Integrating physical activity into routine healthcare
5. Improving Overall health outcomes and quality of life

Additionally, the study will focus mainly on cardiovascular diseases, diabetes, and mental health challenges by primarily considering the adult population, excluding pediatric populations with unique physical activity considerations, and mainly evaluating and referring to evidence-based recommendations.

2. Methodology

2.1 literature and search strategy

The research literature search strategy for advising patients in physical activity related to patient disease and health status was mainly conducted by the help of the PubMed Database as it has a wide variety of articles and knowledge related to the topic. Furthermore, PubMed is extremely reliable as it contains millions of articles from peer-reviewed journals as well as it contains articles from the latest medical research. Similarly, the articles from PubMed citate their sources making it easier for reader to assess the credibility. Additionally, this database was better adapted in selecting the inclusion criteria and remove unnecessary articles.
The key search terms included “physical activity”, “health”, “cardiovascular diseases”, “diabetes”, “mental health” and a combination of these. The research was refined by applying some search filters which will be discussed in 2.2.1 inclusion criteria. For the research were only articles chosen which were published no earlier than 10 years from the year 2025.
The research results were cited by using the help of the Zotero reference management system.

2.2 selection criteria

The selection criteria for this review were meticulously assessed and applied to guarantee that only the most relevant and high-quality studies were included in addressing the clinical question. A systematic approach was used to evaluate each source, ensuring that the chosen literature directly contributes to the understanding of the relationship between physical activity, patient health status, and disease management. The specific inclusion and exclusion criteria are outlined below.

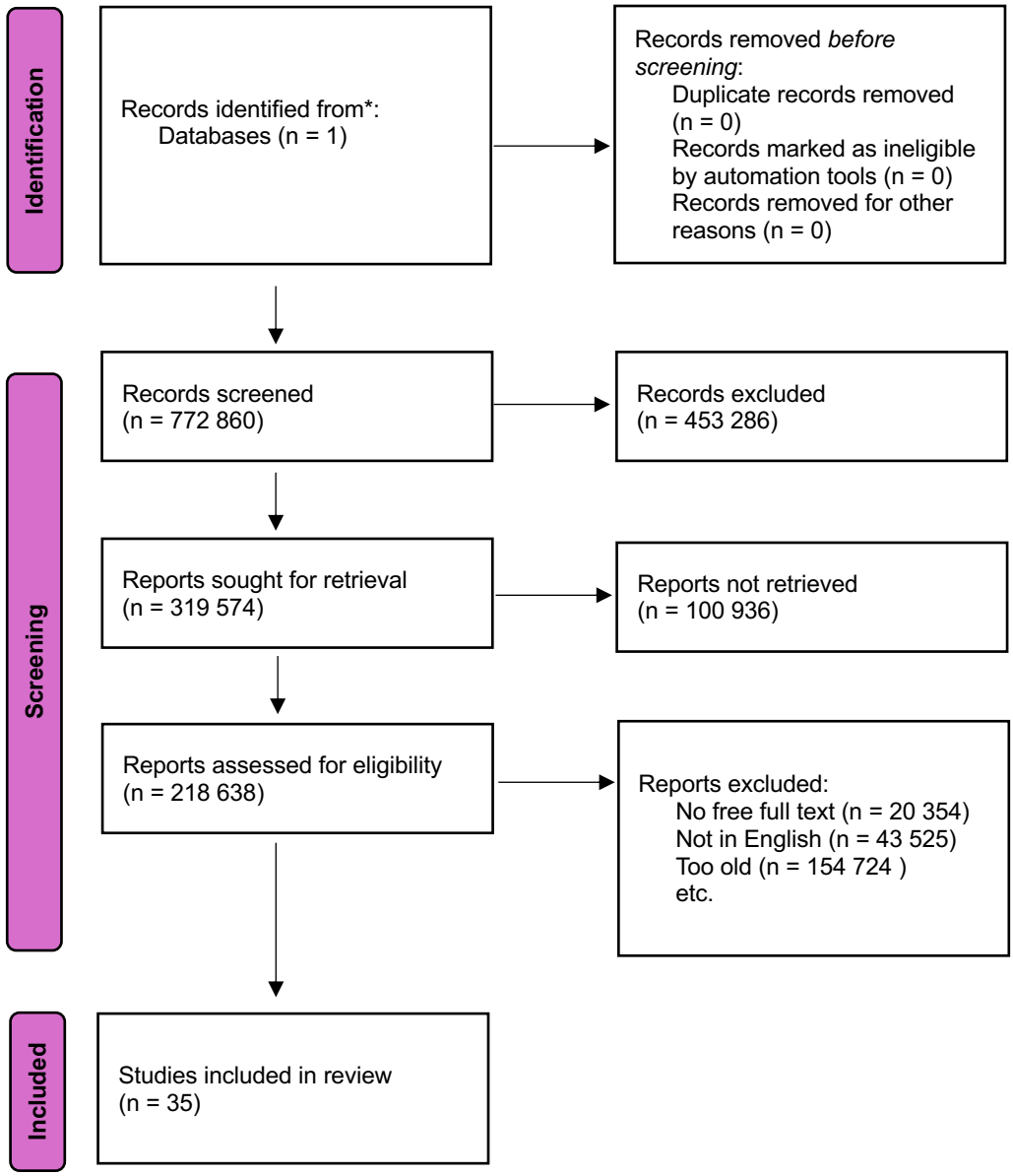
2.2.1 inclusion criteria

This review incorporated peer-reviewed research articles, systematic reviews, meta-analysis and clinical trials. These study types were selected due to their ability to provide high-quality and evidence-based insights into the relationship between physical activity and patient health status. Systematic reviews and research articles were prioritized for their comprehensive synthesis of existing literature, while clinical trials were included to assess the direct impact of physical activity interventions on various health conditions.
The review primarily focused on adult populations diagnosed with a range of chronic and acute health conditions. Studies involving individuals with cardiovascular diseases, diabetes, musculoskeletal disorders and mental health disorders were included to ensure a broad understanding of how physical activity can be tailored to different medical needs. Pediatric populations were excluded to maintain consistency in the evaluation of health outcomes and exercise recommendations, as children and adolescents have distinct physiological and developmental considerations that require separate analysis.
Overall, 19 articles were included by the end of the thesis. At first, there were 28 articles but 9 articles were excluded mainly because they focused less on physical activity but more on the disease itself for example, on diabetes.

2.2.2 exclusion criteria

To maintain the accuracy, reliability and clinical relevance of this review, specific exclusion criteria were applied during the selection process. These criteria were designed to filter out studies that did not meet the required standards for inclusion, ensuring that only the most relevant and high-quality evidence was considered.
Study Types: Studies with unclear or poorly defined methodologies were excluded to prevent the inclusion of unreliable or inconclusive data. Furthermore, animal studies were not included, as the focus of this review is on human health outcomes and not on animals.

Language: Articles published in languages other than English were excluded to avoid potential misinterpretation of study findings and ensure accessibility to widely recognized research.
Publication Date: Studies published before 2010 were excluded to prioritize recent findings and current best practices in advising patients on physical activity. This criterion ensures that recommendations align with the latest clinical guidelines and research advancements.
Patient Population: Studies focusing on pediatric populations were excluded, as children and adolescents have unique physiological and developmental considerations that require separate analysis. This review primarily targets adult populations with chronic or acute health conditions.
Outcomes: Studies that reported non-relevant or unclear outcome measures were excluded to ensure that only meaningful and applicable data were considered. Research that did not contribute valuable insights into the relationship between physical activity, disease status, and health outcomes was omitted.
Additionally, a PRISMA flow diagram was utilized to visually represent the study selection process, including the number of records identified, screened, included, and excluded at each stage.



3. Overview of physical activity and health

3.1 Definition and Types of physical activity

The WHO defines physical activity as “any bodily movement produced by skeletal muscles that requires energy expenditure. Physical activity refers to all movement including during leisure time, for transport to get to and from places, or as a part of a person’s work or domestic activities“(6).

The types of physical activity can be divided into three main types which are aerobic, muscle strengthening, bone strengthening and balance activities (7). Out of these three, the aerobic or endurance activity is the one that benefits the most in terms of prophylactic cardiovascular diseases, Type 2 Diabetes mellitus and lung diseases.

Aerobic exercise involves the activation of large muscle groups, such as those in the arms and legs, and is often known as endurance training. For instance, jogging, swimming, bicycling, gardening, walking or football. With regular practise, it strengthens the cardiovascular and respiratory systems, enhancing their efficiency and overall endurance. This can be further classified into:

1. Light-intensity activities which are carried out in the everyday life such as going to work and do not require much effort
2. Moderate-intensity activities require more effort on the heart, lungs and muscles. When applied on a scale from 1 to 10, it will be rated as a 5 or 6 on intensity level with an increase in the heart rate and increase in breathing rate
3. Vigorous-intensity activities require much more stamina and are rated as a 7 or 8. While undergoing vigorous-intensity activity a person cannot talk without a break from the activity; talking is too difficult while working out (7).

Overall, light-intensity activity is better for the heart than no physical activity.

Muscle-strengthening activity puts focus on the power of a certain muscle group such as in powerlifters where the focus lies more on power and only a small amount is focussed on the endurance. This type of physical activity is commonly seen in people who like to do weightlifting or bodybuilding. Similarly, this activity is better for the heart than no physical activity.

Bone-strengthening activity primarily focusses on improving bone stability and strengthening by the help of a person’s own body weight such as in jumping rope. This type of physical activity can be combined or be a part of muscle-strengthening or aerobic activity such in weightlifting or running.

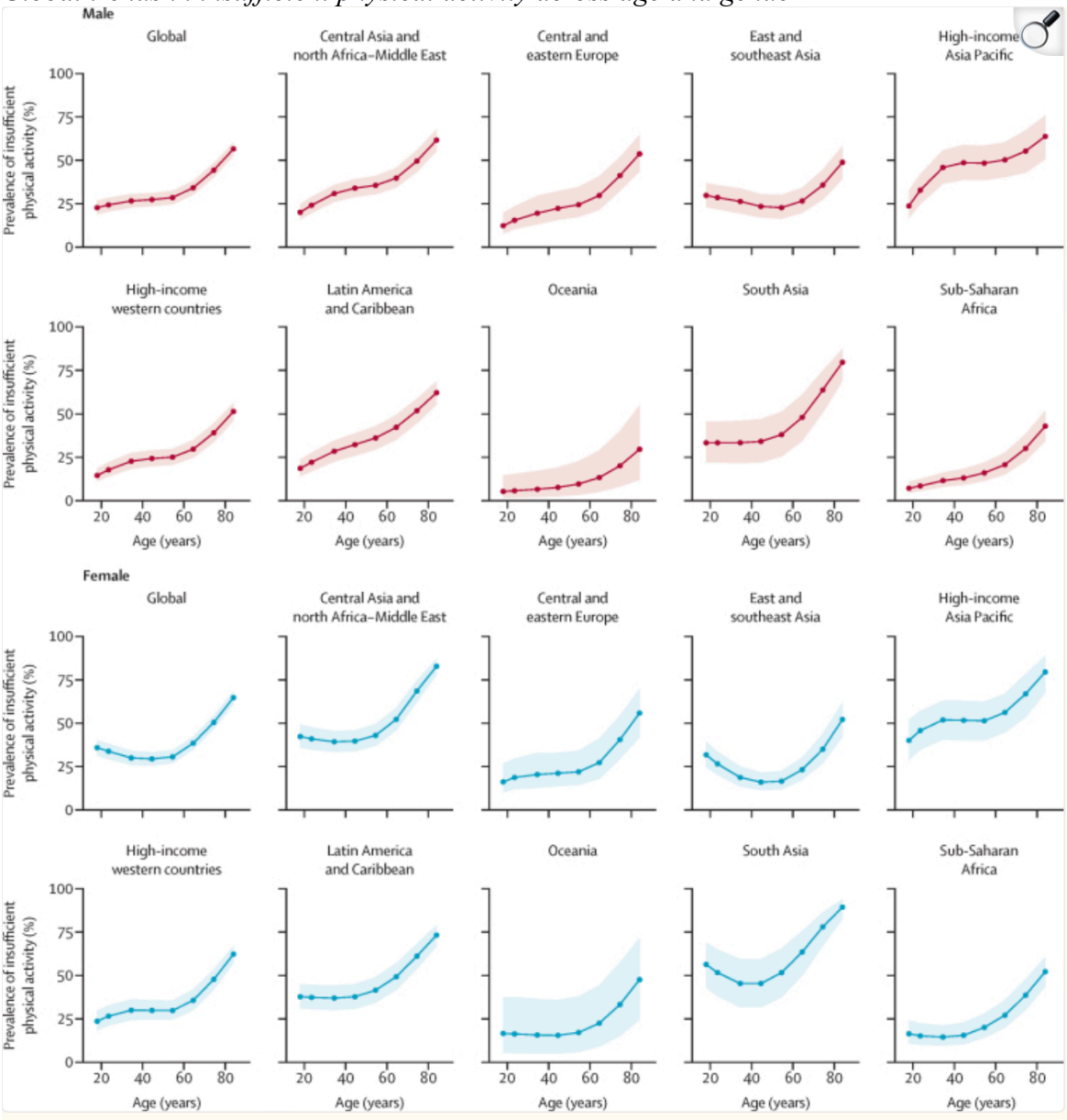
Balance activities improve and help to prevent falls while walking or being stationary. Typical examples include standing on one leg or walking backwards. This type of activity is often seen in neurological conditions such as Parkinson where people tend to fall. Studies analysing whether balance activities could reduce or prevent falls in patients with Parkinson showed that falls were reduced in people with milder disease but not in those with more severe Parkinson disease (8).

3.2 Epidemiology: Trends in Physical Activity Across Populations

A significant global increase in insufficient physical activity has been observed, with approximately 31.3% of adults (1.8 billion people) falling short of recommended activity levels in 2022, compared to 23.4% (900 million) in 2000. Many countries are not making adequate progress toward the 2030 goal of reducing inactivity by 15%, and trends indicate a movement in the wrong direction. Additionally, inactivity has risen sharply among individuals

aged 60 and above, with distinct regional and gender-related variations seen in younger age groups, as shown in the table below (9). Here we can see that the prevalence of physical inactivity is increasing globally when a person becomes older. Furthermore, it can be seen, that for some regions women tend to have more insufficient physical activity than men especially in south Asia. Regions like Oceania, South Asia and Latin America also show a higher prevalence of insufficient inactivity in women compared to men.

Global trends in insufficient physical activity across age and gender



(9)

Despite the overall rise in inactivity, some regions have made progress. Several Western European nations are on track to meet activity targets, with 12 countries classified as progressing positively. In the EU, engagement in non-sport physical activities increased from 44% in 2017 to 53% in 2022. Oceania has shown the most notable relative improvement, particularly in nations such as the Cook Islands, Samoa, and the Solomon Islands, where inactivity levels have declined—possibly due to stronger policy initiatives. However, in areas where inactivity was already low, progress remains uncertain due to insufficient data.
In summary, nearly one-third of the global adult population is not engaging in enough physical activity, and most countries are not on course to meet the 2030 target. Immediate

action is necessary to bridge disparities in activity levels between genders and age groups. Although effective policies exist, their implementation has been inconsistent. Countries demonstrating positive outcomes should share their strategies, and broader efforts must focus on increasing investment and fostering multisectoral collaboration to enhance physical activity at both national and local levels (9).

3.3 physical, psychological and social health impact of physical activity

Physical activity has many benefits nut only on the personal health but also shows positive effects on the social and mental health.

Firstly, regular exercise controls body weight making a person feel better in their body increasing their confidence and happiness in life. Secondly, regular exercise boots energy, giving a person more energy in their everyday life and for work, making their performance better. Furthermore, exercise promotes better sleep, reducing depression and improving their performance at school or at work. Additionally, exercise does not have to be carried out alone, it can be done in teams such as in playing football or basketball. In these teams, a person meet new people as well as having fun while doing the activity, which can reduce the risk of depression (10).

Exercise can significantly enhance mental well-being by boosting mood and alleviating symptoms of depression. It also promotes better stress management and improves sleep quality. For older adults, physical activity strengthens cognitive functions such as short-term memory, planning, and decision-making. Research has consistently shown the positive effects of exercise on mental health, as it involves bodily movement and muscle engagement through activities like walking, running, dancing, swimming, yoga, or gardening. The duration of exercise programs also plays a role, with longer programs often demonstrating greater psychological benefits. Mild to moderate mental health conditions, including depression and anxiety, can be effectively managed through regular physical activity. Increased aerobic exercise or strength training has been shown to significantly reduce depressive symptoms, despite lower activity levels among those with depression. Additionally, exercise offers benefits for anxiety and panic disorders comparable to those of meditation or relaxation techniques(11).

Research suggests that increasing moderate-to-vigorous physical activity among U.S. adults aged 40 and older could prevent approximately 110,000 deaths annually. Even an additional 10 minutes of daily exercise can have a significant impact on overall health. Studies also indicate that taking more steps per day reduces the risk of premature death from all causes. For adults under 60, this risk decreases and stabilizes at around 8,000 to 10,000 daily steps, while for those aged 60 and older, the benefits level off at approximately 6,000 to 8,000 steps per day (12).

Mechanisms of physical activity and improvements of mental health

Several psychological theories have been proposed to explain the positive impact of physical activity on mental health, with three key hypotheses being distraction, self-efficacy, and social interaction. The distraction hypothesis suggests that engaging in exercise diverts attention from negative stimuli, leading to mood improvement both during and after physical activity. The self-efficacy hypothesis emphasizes that because exercise can be a challenging task, regularly participating in it may enhance self-confidence and emotional well-being. Meanwhile, the social interaction hypothesis highlights the role of social connections and mutual support in exercise settings, which contribute to its mental health benefits (13).

In addition to these, there are also 2 main psychological hypotheses where one involves endorphins and the other monoamines: The monoamine hypothesis suggests that exercise enhances synaptic transmission of these neurotransmitters similar to the mechanism of antidepressant medications. However, since the effectiveness of antidepressants is not solely due to increased monoamine transmission, this explanation alone may be overly simplistic in accounting for the mood-enhancing effects of exercise.

The endorphin hypothesis, on the other hand, is based on the idea that physical activity triggers the release of endogenous opioids, particularly beta-endorphins. These substances are believed to have calming effects on the central nervous system, contributing to improved mood after exercise. Some evidence also suggests that individuals who suddenly stop exercising may experience irritability, restlessness, and frustration, potentially linked to endorphin withdrawal (13).

In conclusion, there is no clear connection on the relative significance of psychological and physiological hypotheses in explaining the link between physical activity and mood enhancement. The most likely explanation is a psychobiological model that integrates multiple factors. To refine this model, further research is needed to better understand the mechanisms connecting physical activity to each hypothesis and how these processes contribute to improved mood.

4. Excessive exercise

For some individuals, exercise can become an obsession leading to excessive training which can lead to medical risks and potential harm to personal and professional relationships. There are some signs which show up once the body is overtrained; these can be an energy loss in the everyday life where a person may feel less motivated to go out and rather stay home and sleep. Similarly, there can be a profound feeling of fatigue and for woman a loss of their period (14).

One of these conditions is muscle dysmorphia, where individuals especially bodybuilders think they are too skinny despite their huge amounts of muscles. Nowadays, the image of a body has extremely changed compared to 50 years ago; if a person compares professional bodybuilders on stage now to bodybuilders 50 years ago, one can see that the amount of bodyfat of an athlete has decreased over time whereas the amounts of muscles have increased. Due to the time of social media, many bodybuilders have become idols to many people, making them want the same muscular shape. This negatively impacts a person's mental health as he or she may think that their body is not as perfect as the one from the idol.
Studies have called this condition "reverse anorexia nervosa", and is composed of 3 criteria:

1. An overwhelming concern that their body lacks adequate leanness (low body fat) and muscularity
2. This concern leads to distress and disrupts social interactions
3. There is no other psychiatric condition responsible (13)

The second problem linked to excessive exercise is the use of anabolic-androgenic-drugs aiming to gain more muscles faster. These drugs which are primarily used by gym athletes or bodybuilders, highlight a link between exercise and mental health risks. Their use is associated with increased irritability, aggression, manic or psychotic symptoms, and even criminal behavior. Withdrawal can lead to depressive symptoms, and prolonged use may result in dependence (13).
Thirdly, studies have also shown negative mood disturbances. While moderate physical activity is linked to mood improvement, intense exercise can have the opposite effect. Studies show that mood may worsen immediately after a single high-intensity session and even more after several days of intense training. Long-term mood benefits are primarily associated with moderate exercise, whereas prolonged high-intensity training can lead to mood disturbances. These effects are particularly observed in elite endurance athletes, whose rigorous training cycles involve high-intensity interval training to enhance performance. Research indicates that mood tends to decline during the peak training phase and improves as competition approaches, suggesting a complex relationship between exercise intensity and mental well-being (13).
Lastly, for extreme athletes an overtraining syndrome can occur which occurs when athletes exceed their physical limits without adequate rest, leading to persistent fatigue, sleep disturbances, weight loss, irritability, muscle soreness, and even depression. While many athletes experience temporary mood fluctuations without performance decline, excessive training can cause more severe problems. This condition affects between 7% and 20% of athletes per season, with higher prevalence among endurance sports participants. It is marked by a decline in performance, prolonged fatigue, and mood disturbances that do not improve with short-term rest. Various physiological changes, such as hormonal imbalances and immune system alterations, have been observed, though no definitive diagnostic test exists. Due to its similarities to depression, some researchers propose a common underlying cause, though recovery typically requires extended rest. Since prolonged inactivity can negatively impact an athlete's career, monitoring mood changes has been suggested as an effective method for early detection and prevention (13).

In conclusion, these conditions are mostly linked to individuals who undergo extremely intense workouts and mostly to those who perform these sports as their profession. Furthermore, there are some options a person can do to limit their physical suffering from an overtraining period, such as reducing muscle soreness by taking a cold shower where the effect of the coldness induces a vasoconstriction of blood vessels and therefore reducing blood supply to affected areas. Most importantly, it is extremely beneficial to do some stretching after a workout which helps relax the muscles (15).

5. Cardiovascular conditions

Regular physical activity is a key factor in preventing cardiovascular disease (CVD) by reducing cardiometabolic risk factors and improving overall heart health. For individuals with existing CVD, exercise helps slow disease progression, lowers the risk of additional chronic conditions, and enhances quality of life. Despite its benefits, physical activity levels tend to decline over time due to biological, behavioral, and psychosocial factors, often influenced by major life events. Even short-term reductions can accumulate, increasing susceptibility to CVD and related health risks (16). Furthermore, regular moderate- to vigorous-intensity exercise strengthens the heart, enhancing its ability to pump blood efficiently to the lungs and body. This boosts blood flow to the muscles and increases oxygen levels. Additionally, small blood vessels (capillaries) expand, improving oxygen delivery and waste removal (17). Similarly, some experts compare physical activity with a beta-blocker as it helps to slow down heart rate and lower blood pressure (18).
Overall, the benefits of physical activity on cardiovascular conditions are extremely high as it benefits heart health and circulation. Men tend to have a lower risk of severe heart disease than women, largely due to higher levels of physical activity. However, regular exercise can reduce cardiovascular disease risk in women by 30-40%. It helps prevent chronic heart conditions by strengthening the cardiovascular system, improving heart function, enhancing lung capacity for oxygen intake, and promoting better blood vessel dilation. Additionally, exercise positively impacts blood lipid profiles by increasing the ratio of protective HDL to LDL and enhancing fat metabolism, ultimately lowering the risk factors for heart disease and stroke, such as high blood pressure and abnormal cholesterol levels (11).

Natural history of cardiovascular disease

Stages of CVD Progression	Underlying	Susceptible	Subclinical	Clinical	Recovery, Disability or Death
Stages of Prevention	**Primordial** Risk factor reduction targeted towards the *entire population* through a focus on social and environmental conditions. **Goal:** Reduce population prevalence of risk factors.	**Primary** Risk factor reduction aimed at a *susceptible population* or individual. **Goal:** Prevent development of subclinical disease.	**Secondary** Early disease detection (screening) **Goal:** Diagnose disease in subclinical phase to improve prognosis.	**Tertiary** Disease management, reduction of disability, and co-morbidities **Goal:** Reduce severity of disease and any adverse sequelae.	
Examples	• Sidewalks to promote activity • Health promotion campaigns	• Exercise programs for overweight individuals	• Cardiopulmonary exercise testing • FitnessGram® • Physical activity readiness screeners	• Cardiac rehabilitation	
Life stage	**In-utero** **Infancy** **Early childhood** **Childhood and adolescence** **Young adults** **Midlife** **Older adults**				

(16)

Although physical activity for children and infants was an exclusion criteria, it is important to note that this table was included to acknowledge that cardiovascular disease (CVD) prevention can begin before birth (in-utero) and continues through infancy, childhood, adolescence, young adulthood, midlife, and older age. This perspective emphasizes that risk accumulates over a lifetime, and interventions should be applied at different life stages for maximum effectiveness. To sum up, this table outlines the natural history of CVD using a life course framework and an epidemiological prevention model. It categorizes disease progression into different stages and matches them with corresponding stages of prevention to illustrate how prevention strategies can be applied at different life stages.

The different stages of cardiovascular disease progression shown in the table are as follows:

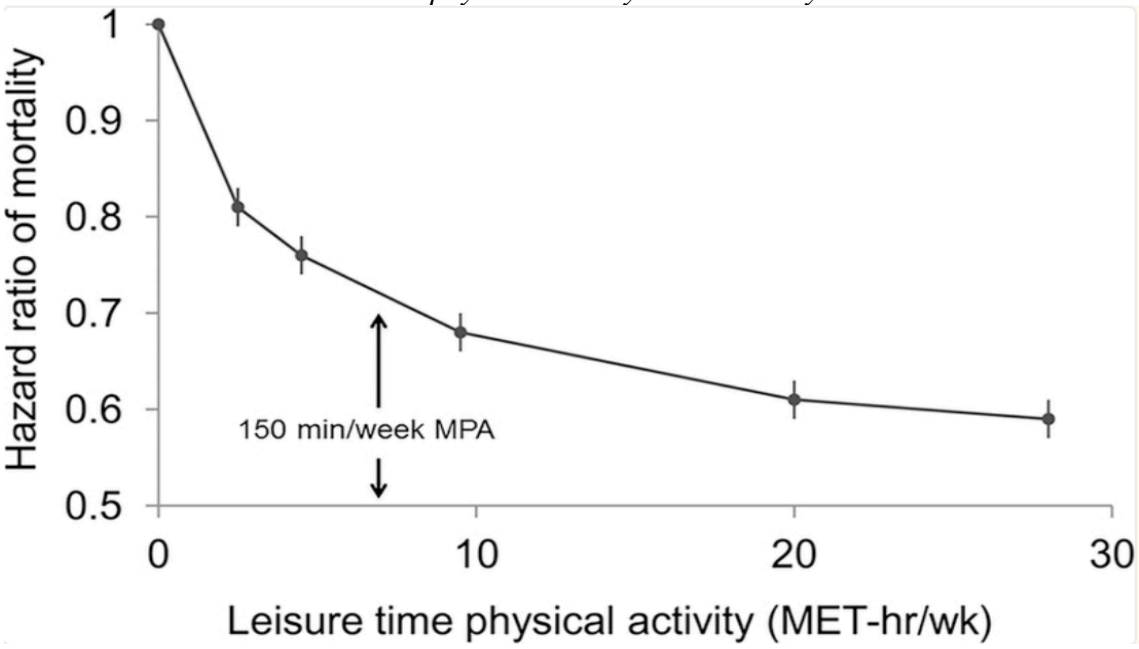
1. **Underlying:** Risk factors exist in the population but do not yet affect individuals.
2. **Susceptible:** Individuals are at risk but have not developed disease.
3. **Subclinical:** Early, undetected disease is present.
4. **Clinical:** The disease is diagnosed and has significant health consequences.
5. **Recovery, Disability, or Death:** The outcomes following clinical disease, including management, rehabilitation, or mortality.

Furthermore, the different stages of prevention are as follows:

1. **Primordial Prevention:** Targets the entire population by reducing societal and environmental risk factors. Example: Creating walkable sidewalks to encourage activity.
2. **Primary Prevention:** Focuses on individuals at risk to prevent disease onset. Example: Exercise programs for overweight individuals.
3. **Secondary Prevention:** Involves early detection and screening to identify disease before symptoms appear. Example: Cardiopulmonary exercise tests.
4. **Tertiary Prevention:** Aims to manage disease, reduce complications, and improve quality of life. Example: Cardiac rehabilitation

In conclusion, it is important to note that early-life interventions are crucial as the primordial prevention in early childhood and adolescence can significantly reduce the lifetime risk of having a cardiovascular disease. Additionally, the lifelong physical activity is advised to reduce CVD risks.

Association between leisure time physical activity and mortality risk



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The graph illustrates the relationship between leisure-time physical activity, measured in MET-hours per week, and the hazard ratio of all-cause mortality. It shows a clear inverse

association, indicating that as physical activity increases, the risk of mortality decreases. The steepest decline in mortality risk occurs at lower levels of physical activity, with approximately 70% of the total benefit achieved at around 8.25 MET-hours per week, which corresponds to 150 minutes of brisk walking. This suggests that even the smallest amounts of physical activity significantly reduce the risk of death, meaning that any amount of physical activity is better than none. The data also indicate that there is no apparent upper threshold at which increased physical activity leads to harm; instead, the risk reduction continues without evidence of increased mortality at the highest activity levels. These findings align with previous research on all-cause mortality, cardiovascular disease mortality, ischemic stroke, and heart failure, reinforcing the importance of engaging in regular moderate-to-vigorous physical activity to improve longevity and overall health (19).

5.1 Physiology

Physical activity helps reduce the risk of cardiovascular disease (CVD) by influencing key risk factors such as body weight, high blood pressure, diabetes, and cholesterol levels. However, the exact biological processes behind these benefits are not yet fully understood. Regular exercise helps prevent hypertension by affecting the sympathetic nervous system, the renin-angiotensin system, sodium regulation, and blood vessel function—independent of weight control. Additionally, physical activity enhances insulin sensitivity and glucose absorption in muscles, lowering diabetes risk. Aerobic exercise also improves lipid profiles by reducing triglycerides and LDL ("bad" cholesterol) while increasing HDL ("good" cholesterol). Further research is needed to clarify the precise mechanisms by which physical activity protects against CVD (16).

5.2 Prevention in young adulthood (18-44 years), middle adulthood (45-64 years) and older adulthood (over 65 years)

In young adulthood, primary prevention of cardiovascular diseases focuses on reducing risk factors through physical activity. Studies, including observational research and clinical trials, show that exercise helps prevent weight gain and lowers the risk of developing conditions like hypertension and diabetes. Research from the CARDIA study highlights that higher physical activity and cardiorespiratory fitness in young adults reduce the long-term risk of premature mortality and cardiovascular events. By adulthood, atherosclerosis may have already begun, as seen in autopsy studies where many young soldiers showed early signs of arterial plaque buildup. As risk factors accumulate, lifestyle changes like improving diet and increasing physical activity are the first-line treatments, often alongside pharmacotherapy. Since CVD may not become clinically apparent until later in life, long-term studies are needed to determine the optimal type and intensity of physical activity for prevention. Future research may also explore personalized exercise recommendations based on genetics, biomarkers, and individual responses to training (16).

Middle adulthood is a time of many life changes, including moving, job transitions, family changes, and health issues like menopause or chronic illness. Cardiovascular and cardiometabolic diseases become more common, with high rates of coronary artery disease, diabetes, hypertension, and severe obesity. Atherosclerosis progresses, sometimes leading to serious events like myocardial infarction (MI) or stroke, though hospitalizations and deaths from these events remain relatively low. Regular physical activity can help slow disease progression and improve health outcomes. A popular method nowadays is by wearing smartwatches which track the amounts of steps a person does during a day. Exercise stress testing is a common method for diagnosing and monitoring CVD. It evaluates heart function under physical stress using an electrocardiogram (ECG) and blood pressure monitoring, often combined with imaging methods like echocardiography or nuclear scintigraphy for better accuracy. While submaximal stress tests help design exercise plans, maximal stress tests are preferred for diagnosis and prognosis. For individuals with established CVD, lifestyle changes such as diet, exercise, weight management, and quitting smoking are crucial, often

alongside medications. Guidelines recommend 30–60 minutes of moderate-intensity exercise per day. Studies show that coronary artery calcification does not increase exercise-related risk, though more research is needed in women. Those with advanced CVD may benefit from cardiac rehabilitation, which can improve functional capacity and survival.

Most studies on physical activity and CVD focus on middle-aged adults, making findings reliable across different populations. However, many studies rely on self-reported physical activity or short-term wearable device measurements, which may lead to misclassification. Future research should focus on long-term activity tracking using continuous wearable technology and explore the relationship between physical activity and sleep to gain deeper insights into lifestyle effects on CVD (16).

Older adulthood brings health and life changes that can affect physical activity, such as chronic conditions (diabetes, cancer, osteoarthritis), loss of a partner, and retirement. Many older adults experience functional heart changes, including issues with blood pressure, heart rhythm (arrhythmias), and heart function, increasing CVD risk. In this age group, CVD and its risk factors are highly common:

1. Hypertension: >65%
2. Clinical or subclinical CVD: ≈65%
3. Atrial fibrillation: 5–10%
4. Moderate-severe valve disease: ≈10%
5. Heart failure: 5–10%

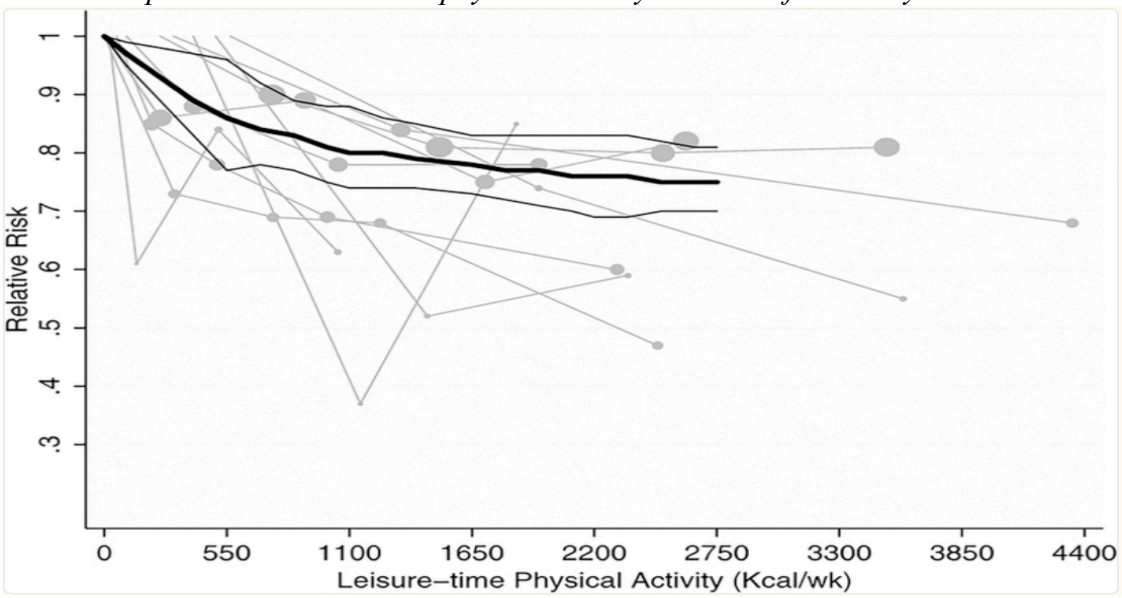
The main challenges with older adults are that they may face functional limitations, such as slow gait speed, making physical activity harder. Shorter periods of sitting have been linked to a lower CVD risk in older women. Walking is a low-risk and preferred activity. Ways to encourage physical activity for them would be by wearing wearable devices to track movement which are nowadays very simple to use. Furthermore, physicians should always provide guidance, encouragement and motivation for the lifestyle of the patient, the family of the patient should also be included for motivation and guidance (16).

5.3 Coronary heart disease

Coronary heart disease is a type of heart disease that occurs when the arteries of the heart cannot deliver enough oxygen-rich blood to the heart due to narrowing from the buildup of fatty deposits called plaque (20). These plaques are mostly due to atherosclerosis which can occur due to less physical activity. For most people, coronary heart disease is preventable with a healthy lifestyle including regular physical activity and a balanced diet (21).

Exercise plays a crucial role in both the primary and secondary prevention of Coronary Artery Disease (CAD), offering benefits that surpass those of Percutaneous Coronary Intervention (PCI). A recent randomized controlled trial evaluating the PATHway system, an internet-based home cardiac rehabilitation program, demonstrated its effectiveness in maintaining physical activity and fitness in patients with cardiovascular diseases post-rehabilitation. Additionally, a two-year study of men with stable CAD found that regular exercise led to better outcomes than PCI, including higher event-free survival rates (78% vs. 62%), greater improvements in maximal oxygen consumption (10% vs. 7%), and significant reductions in inflammatory markers such as high-sensitive C-reactive protein and interleukin-6, which remained unchanged in the PCI group (22).

Relationship between leisure time physical activity and risk of coronary heart disease



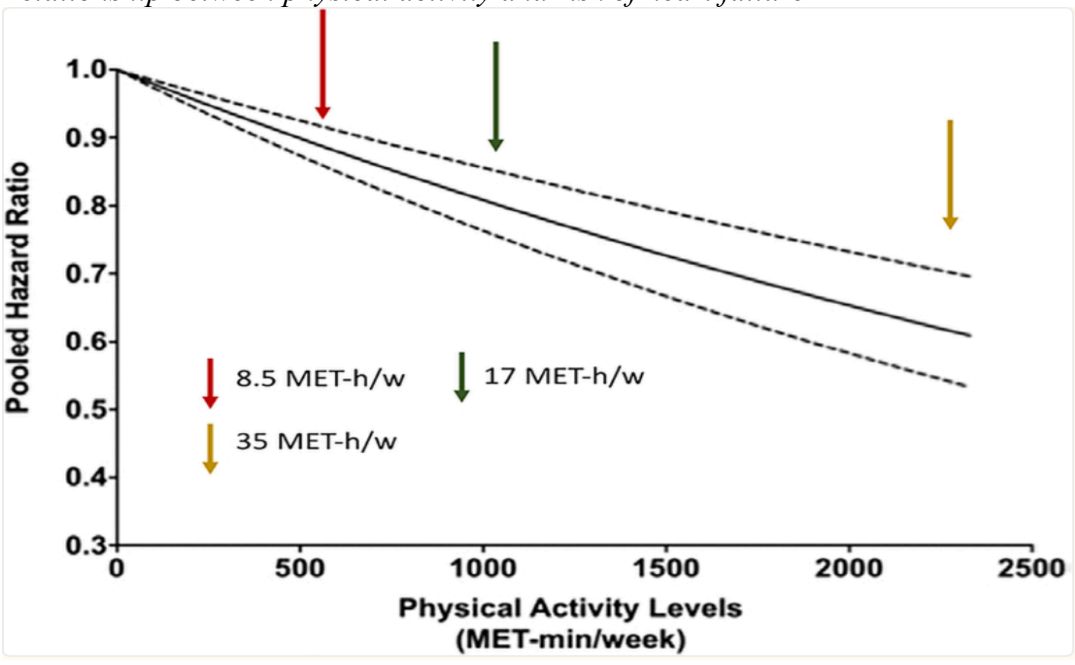
(19)

This graph shows an inverse dose-response relationship, meaning that as physical activity increases, the risk of coronary heart disease decreases. Even for those who meet only the lower limit of the 2008 Guidelines (150 minutes per week) have a 14% lower risk compared to those who do no leisure-time physical activity. The dose-response curve follows a pattern similar to that of all-cause mortality and cardiovascular mortality, with early reductions in risk and continued benefits at higher activity levels (19).

5.3 heart failure

Heart failure happens when the heart can't pump blood as well as it should. This can cause blood to back up and fluid to build up in the lungs, leading to shortness of breath. Conditions like high blood pressure and narrowed heart arteries can make the heart too weak or stiff to work properly. While heart failure is serious, treatment can help manage symptoms and improve quality of life. Losing weight, exercising, reducing salt intake, and managing stress can make a difference. However, in severe cases, some people may need a heart transplant or a device to support their heart function (23).

Relationship between physical activity and risk of heart failure



(19)

This graph shows the correlation of moderate-vigorous physical activity with the risk of heart failure. It shows an Inverse Relationship: As physical activity levels increase, the risk of heart failure decreases. This supports the idea that more physical activity provides greater protective benefits against heart failure. It concludes that engaging in moderate-to-vigorous physical activity significantly lowers the risk of heart failure, with greater reductions seen at higher activity levels. Even a small amount of exercise is beneficial, but more activity provides even greater protection. The study highlights the importance of exceeding the minimum guidelines, particularly for individuals with a highly sedentary lifestyle.
The same study found that people who did the minimum recommended exercise (about 500 MET-minutes per week) had a small reduction in risk, but those who exercised more saw even greater benefits. Unlike other heart conditions where the biggest benefits happen early on with small amounts of exercise, for heart failure, the risk keeps decreasing more steadily as activity levels increase. However, current research does not separate different types of heart failure, so more studies are needed to understand how exercise affects each type (19).

Special considerations

Antihypertensive medications can impact exercise performance and should be considered when prescribing physical activity. Beta-blockers, for example, which are used to lower blood pressure and for heart failure treatment, limit heart rate elevation, making traditional target heart rate monitoring unreliable. Instead, exercise intensity should be assessed using the rate of perceived exertion (RPE) or determined through a graded stress test while on medication. Vasodilators, alpha-blockers, and calcium channel blockers may cause sudden drops in blood pressure during or after exercise. To mitigate these effects, a proper warm-up and cool-down are recommended. Additionally, patients should be advised to avoid the Valsalva maneuver during resistance training to prevent excessive blood pressure fluctuations (22).

6. Diabetes and metabolic syndromes

Being active offers numerous benefits for individuals with type 1, type 2, or other types of diabetes. Regular physical activity can help the body use insulin more effectively, potentially reducing the need for insulin by lowering insulin resistance. It also aids in maintaining blood sugar levels within the target range and improving HbA1c. For some people with type 2 diabetes, exercise can even contribute to remission. Additionally, physical activity helps reduce blood pressure, improve cholesterol levels, and protect against diabetes-related health issues such as heart disease. It supports weight loss and helps maintain a healthy weight. Regular movement boosts energy, promotes better sleep, enhances joint flexibility, and supports mental health by releasing endorphins, which reduce stress and improve mood (24).

Diabetes

Diabetes currently affects over 463 million people worldwide, with a prevalence of 10.5% in the United States. Type 2 diabetes (T2D) accounts for 90-95% of these cases. Treatment aims to create individualized plans, including education, glycemic management, cardiovascular disease risk reduction, and screening for complications, to maintain optimal blood glucose, lipid, and blood pressure levels, preventing chronic issues. Treatment often includes lifestyle interventions, medications, and, in some cases, bariatric surgery. During physical activity, glucose uptake into muscles increases via insulin-independent pathways, and blood glucose levels are regulated by hormones that promote glucose production and free fatty acid mobilization. Regular physical activity can improve insulin sensitivity, β-cell function, vascular health, and gut microbiota, leading to better diabetes management and a reduced risk of complications (25).

Therapeutic value of physical activity on diabtes

Exercise is a cornerstone of diabetes management, recommended by all clinical guidelines alongside diet. It helps regulate blood glucose by increasing glucose uptake into muscles through both insulin-dependent and independent mechanisms. When muscles contract during exercise, it stimulates glucose transporter 4 (GLUT4) translocation, allowing more glucose to enter muscle cells. This process reduces blood glucose levels and improves insulin sensitivity, which can last up to 48 hours after exercise. Regular moderate exercise boosts GLUT4 expression and enhances insulin receptor signaling, improving glucose oxidation and storage in muscles. The type, intensity, and duration of exercise influence its effectiveness in improving insulin sensitivity, with moderate exercise typically offering the most benefits for individuals with type 2 diabetes (T2D). Consistent daily exercise is key, even if it's a small amount. Research shows that combining aerobic and resistance training provides significant benefits for managing blood glucose levels and lowering HbA1c, with even short, high-intensity interval training (HIIT) sessions proving effective in reducing post-meal blood sugar spikes. For individuals with type 1 diabetes (T1D), exercise has mixed effects on overall blood sugar control, but it offers other benefits like increased fitness and reduced insulin requirements. Studies show that exercise training can reduce daily insulin doses by 6-18%, and active individuals with T1D tend to have a lower risk of mortality compared to sedentary individuals. Exercise also triggers beneficial biological responses, such as improving antioxidant defenses and reducing inflammation. Low-intensity exercise produces reactive oxygen species, which activate molecular mechanisms that enhance insulin sensitivity and reduce markers of inflammation. This positive stress response is crucial for managing diabetes and improving overall health. While exercise is crucial for managing T2D, medication may be necessary to achieve optimal blood sugar control. Even with pharmacological treatments like metformin, exercise remains an essential component of diabetes care, showing comparable or superior effects in controlling post-meal blood sugar levels. Incorporating regular exercise and a healthy diet is vital for improving cardiometabolic health in individuals with diabetes (26) (27).

In conclusion, exercise does not only have benefits on diabetes mellitus itself but also on its complications: Studies indicate that higher physical activity levels are associated with lower mortality rates, and exercise capacity serves as a predictor of mortality in individuals with diabetes, similar to trends seen in the general population. Additionally, reduced exercise capacity in type 2 diabetes is linked to an increased risk of future cardiovascular events. Beyond mortality, physical activity is associated with fewer diabetes-related complications. Research has shown that exercise improves diastolic function in adults with type 2 diabetes, a benefit not achieved through weight loss alone. A meta-analysis found that physical activity enhances kidney function and reduces markers of kidney damage in both type 1 and type 2 diabetes. Lower levels of physical activity in individuals with type 1 diabetes have been linked to greater risks of renal dysfunction, cardiovascular disease, and retinopathy. Other studies have reported a lower prevalence of nephropathy and neuropathy in those with a history of higher physical activity. Additionally, research indicates an inverse relationship between physical activity and both retinopathy and microalbuminuria. A large cohort study also suggested that physical activity may protect against advanced diabetic retinopathy requiring retinal photocoagulation, though this effect was significant only in men (26).

Barriers for undergoing physical activity

Physical		Overall discomfort ↓ fitness ↑ weight
Pathophysiological		↓ cardiorespiratory fitness ↑ pulmonary capillary wedge pressure Mismatch between skeletal muscle oxygen extraction and oxidative flux Vascular endothelium degradation Impaired in vivo mitochondrial capacity Hypoglycemia
Diabetes Complication-Related	**Cardiovascular**	↑ stress→ CV event
	Nephropathy	Anemia→ ↓ oxygen perfusion
	Neuropathy	Pain Loss of Balance
	Retinopathy	Loss of vision
	Foot Disease	Need for special footwear ↑ frequency of self-foot exam
Social/Psychological		Depression Diabetes Distress ↓ socioeconomic status Community culture

(26)

This table shows the possible barriers that stop a person from undergoing regular physical activity. People with type 2 diabetes often face multiple barriers such as sedentary behavior, excess weight, and physical discomfort during exercise. Obesity, a common issue in T2D, can directly hinder activity, as those with higher body mass indices tend to report more discomfort during exercise. Additionally, lower fitness levels contribute to this barrier, as people with T2D, regardless of age, show reduced cardiovascular fitness and impaired functional exercise capacity, which is associated with lower oxygen consumption. These reductions in cardiovascular fitness are linked to both cardiac and skeletal muscle dysfunction. Studies have shown that individuals with T2D have poorer cardiac performance and abnormal heart strain, even in the absence of overt cardiovascular disease. Furthermore, complications like depression, diabetic nephropathy, retinopathy, neuropathy, and foot ulcers also hinder exercise participation. These conditions create physical and motivational barriers to regular activity. Furthermore, socioeconomic factors often exacerbate the difficulty of maintaining an exercise

routine, as people with T2D tend to have lower socioeconomic status, which is linked to less physical activity. Overcoming these barriers requires a personalized, comprehensive approach, including motivational strategies, community-based programs, and support from healthcare providers. Regular discussions about exercise goals and concerns are important to encourage participation and address health complications (26).

Complications of physical activity for people with diabetes

The most important risk factor of physical activity in people with diabetes the exercise-induced hypoglycemia. Exercise can be risky for individuals with diabetes who take glucose-lowering medications like insulin or sulfonylureas, as it increases the likelihood of hypoglycemia. This risk is particularly significant for those with type 1 diabetes, where severe and nocturnal hypoglycemia are linked to higher mortality rates. While people with type 2 diabetes on these medications also face this risk, it is generally lower. Exercise enhances GLUT4 translocation and expression, amplifying insulin's effects and increasing glucose demand, which can disrupt glucose balance for up to 48 hours. The fear of hypoglycemia is a major barrier to exercise in people with T1D.

Different exercise intensities impact blood glucose differently. Moderate activity leads to a controlled decline in plasma glucose, accompanied by reduced insulin and increased counterregulatory hormones like glucagon. In contrast, vigorous activity triggers a counterregulatory hormone surge that may acutely raise blood glucose levels. Individuals on insulin struggle to regulate these responses, making them more prone to hypoglycemia. After exercise, muscle glycogen depletion further increases glucose uptake for replenishment, lowering plasma glucose levels. Aerobic and resistance exercises affect blood glucose differently in people with diabetes. Moderate-intensity aerobic exercise typically lowers blood glucose more initially, while resistance training can cause a temporary rise followed by increased insulin sensitivity. Resistance exercise is associated with lower post-exercise glucose variability, and HIIT poses a lower risk of hypoglycemia than moderate-intensity aerobic exercise. Performing resistance exercise before aerobic activity may help stabilize glucose levels. However, the ideal exercise regimen to prevent hypoglycemia in type 1 diabetes remains under investigation. To mitigate exercise-induced hypoglycemia, individuals using multiple daily insulin injections or insulin pumps without automated systems should adjust insulin dosing and carbohydrate intake. General guidelines recommend reducing pre-exercise meal insulin by 30-50% within 90 minutes before aerobic exercise and consuming 30-60g of high-glycemic carbohydrates per hour of activity. Post-exercise insulin reductions are especially important for evening workouts to prevent nocturnal hypoglycemia.

One widely recommended strategy is raising the glucose target before and during exercise. Studies have shown that increasing the glucose target before exercise reduces hypoglycemia risk, though it may lead to slightly more time in hyperglycemia (26).

Metabolic syndromes

Metabolic syndrome refers to a cluster of health issues such as high blood pressure, elevated blood sugar, excess abdominal fat, and high cholesterol or triglycerides—that raise the risk of heart disease, stroke, and type 2 diabetes. Having three or more of these conditions qualifies as metabolic syndrome, though even one can significantly increase disease risk (28).

The prevalence of metabolic syndrome—characterized by risk factors like obesity, hypertension, and insulin resistance—has risen significantly, particularly in Western societies. This increase parallels a decline in physical activity levels over recent decades.

Research consistently shows that higher cardiorespiratory fitness (CRF) and increased physical activity are inversely related to metabolic syndrome. While physical activity alone cannot fully normalize metabolic risk factors, it significantly improves overall health outcomes. However, exercise remains underutilized as a treatment, often overshadowed by pharmacological approaches. Despite healthcare systems advocating for physical activity counseling, it is rarely implemented in practice (29).

Physiology of metabolic syndromes

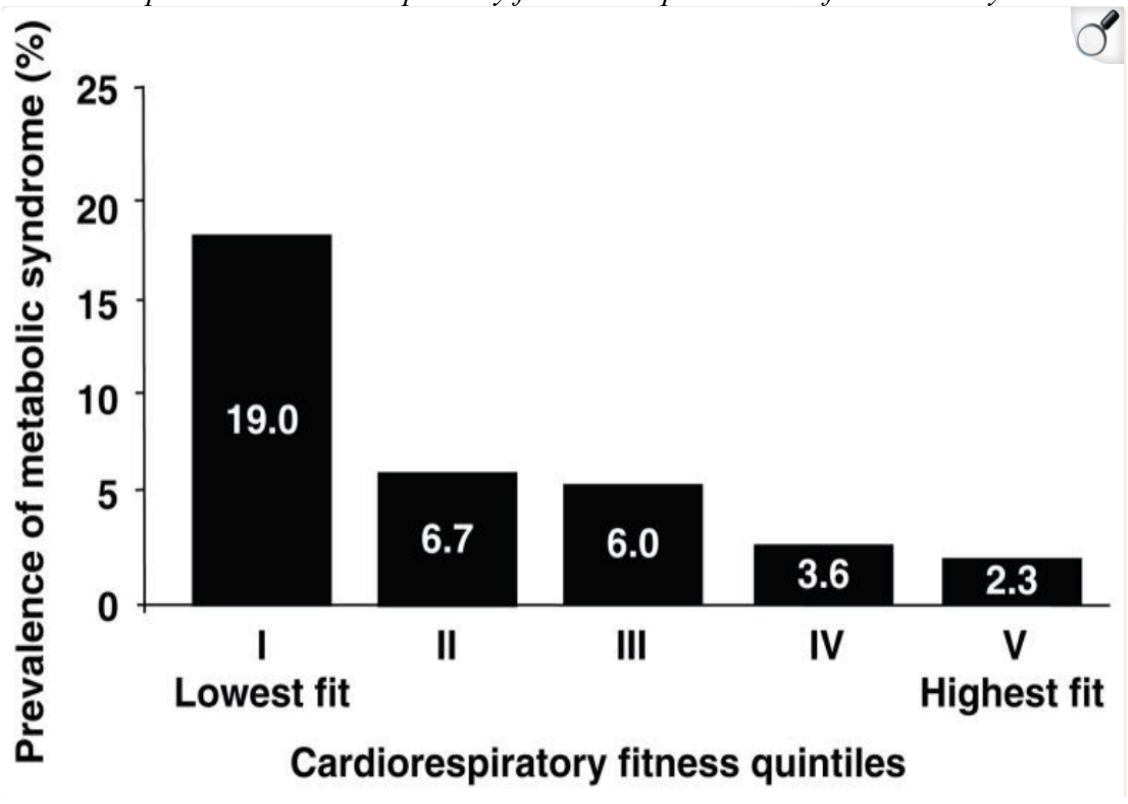
The exact causes of metabolic syndrome remain unclear, though it is strongly linked to the rising prevalence of diabetes and obesity. Key factors include insulin resistance (IR), dysfunctional fat metabolism, and central obesity. However, not all individuals with metabolic syndrome have IR, and not all obese individuals develop the condition, indicating that other mechanisms are involved. Additional contributing factors include inflammation, genetic and epigenetic influences, and disruptions in circadian rhythms. Importantly, higher cardiorespiratory fitness (CRF) appears to counteract the negative effects of these underlying drivers, highlighting the role of physical activity in mitigating metabolic risk. IR plays a central role in metabolic syndrome, although its exact relationship with the syndrome remains complex. Originally described by Reaven as Syndrome X, IR is characterized by reduced insulin sensitivity, leading to compensatory hyperinsulinemia. This condition is associated with glucose intolerance, dyslipidemia, and hypertension, increasing the risk of cardiovascular disease, stroke, and other metabolic disorders.

IR disrupts normal insulin signaling by impairing the phosphoinositide 3-kinase (PI3K) pathway while maintaining activation of the mitogen-activated protein (MAP) kinase pathway. This imbalance contributes to endothelial dysfunction, reduced glucose uptake in skeletal muscle and fat, and increased atherosclerosis risk.

Skeletal muscle, comprising ~40% of body mass, plays a crucial role in glucose metabolism. Exercise enhances insulin sensitivity by promoting mitochondrial biogenesis, fiber-type transformation, and myokine release. Importantly, muscle contractions can increase glucose uptake independently of insulin via GLUT4 translocation. Both aerobic and resistance training improve glucose transport, though they do so through distinct mechanisms. Aerobic training enhances intrinsic glucose metabolism, while resistance training increases glucose disposal primarily by increasing lean body mass.

Exercise remains a key intervention to counteract IR and metabolic syndrome, as demonstrated by studies like the Diabetes Prevention Program, which showed significant reductions in metabolic syndrome prevalence with structured physical activity (29).

Relationship between cardiorespiratory fitness and prevalence of metabolic syndrome



(30)

The graph illustrates the relationship between cardiorespiratory fitness (CRF) and the prevalence of metabolic syndrome in a cohort of over 7,000 women enrolled in the Aerobics Center Longitudinal Study from 1979 to 2000. The data reveal a clear inverse association, with metabolic syndrome being most prevalent among individuals in the lowest CRF quintile (19.0%) and progressively decreasing across higher fitness levels. In the second quintile, the prevalence drops to 6.7%, followed by 6.0% in the third, 3.6% in the fourth, and reaching the lowest prevalence of 2.3% in the highest CRF quintile. These findings emphasize the protective role of higher cardiorespiratory fitness against metabolic syndrome, suggesting that improved fitness levels significantly reduce the risk of developing this condition.

In conclusion, several studies have explored the impact of physical activity and exercise on metabolic syndrome, with consistent findings suggesting that exercise, particularly combined aerobic and resistance training, can have significant benefits. For example, the STRRIDE study found that both moderate and high-intensity exercise improved MS, with high-vigorous exercise also leading to a reduction in body mass index. Similarly, studies like the HERITAGE Family Study have shown that aerobic exercise, such as walking or jogging, reduces the prevalence of metabolic syndrome or its components, including insulin resistance, hypertension, dyslipidemia, and obesity. However, some studies have reported mixed results, especially in older populations or when comparing exercise alone to combined interventions. While resistance training has not been extensively studied in relation to metabolic syndrome, the Finnish Diabetes Trial suggested that it can effectively improve metabolic syndrome components, such as hyperglycemia and dyslipidemia, when performed regularly. Additionally, interval training has been shown to be particularly effective in improving endothelial function, insulin signaling, and reducing lipogenesis in adipose tissue, often surpassing moderate-intensity aerobic training in its benefits for metabolic syndrome Combined interventions, such as pairing exercise with dietary changes, appear to be more effective than exercise alone in reversing metabolic syndrome. For instance, interventions involving both exercise and caloric restriction have led to greater reductions in the syndrome prevalence compared to exercise alone. The Diabetes Prevention Program and Finnish Diabetes Prevention Study both emphasize the benefits of combined lifestyle changes, showing that such interventions significantly reduce the likelihood of developing metabolic syndrome. Beyond exercise, other lifestyle factors, such as diet, smoking, sleep, alcohol intake, and stress, also play a crucial role in the metabolic syndrome. Interventions targeting these factors alongside exercise are often more effective than exercise alone. Studies suggest that a holistic approach, incorporating diet, exercise, and other lifestyle modifications, is necessary for the long-term management and prevention.
Overall, while evidence supports the positive effects of exercise on improving individual components of MS, more research is needed to fully understand its overall impact on the syndrome. Combined interventions that include both exercise and dietary changes likely offer the most substantial benefits in preventing and managing the metabolic syndrome.

7. Physical activity and mental health

Physical activity can help improve mental health as endorphins are released during activity which are responsible for good mood (31).
Mental disorders are highly prevalent and impose a significant global burden. In 2019, an estimated 12% of the population experienced a mental disorder, contributing to around 5% of disability-adjusted life years and 16% of years lived with disability. The impact is further exacerbated by comorbid physical disorders, which reduce life expectancy by 15 to 20 years. Key risk factors for these comorbidities include genetic vulnerability, side effects of medication, and unhealthy lifestyle choices such as poor diet, substance abuse, inadequate sleep, and lack of physical activity. Despite the growing expenses in mental health care, particularly pharmacological treatments, the prevalence of mental disorders has remained relatively stable over the past 30 years, with rates of common conditions like depression and anxiety rising among younger generations.
Pharmacological treatments, including antidepressants and antipsychotics, remain the primary approach for managing mental health symptoms, but their long-term efficacy is questioned. Many individuals experience minimal improvement and significant side effects, such as weight gain, elevated blood glucose, and sexual dysfunction, which can lead to medication discontinuation and worsen the patient's quality of life. Furthermore, primary prevention of mental disorders has seen limited progress, with significant gaps in both evidence and implementation.
To address the growing burden of mental health issues, there is a need for alternative approaches alongside traditional treatments. Physical activity and exercise have emerged as promising strategies for prevention and treatment. Although these approaches are not new, the body of evidence supporting their effectiveness in mental health is expanding. Physical activity, defined as any movement resulting in energy expenditure, and exercise, a structured form of physical activity aimed at improving fitness, have long been recognized for their health benefits, dating back to ancient Greece. Research now confirms that exercise has therapeutic and preventative effects not only on physical health but also on mental health (32).

7.1 Prevention of mental disorders

Physical activity is considered a modifiable protective factor against the development of several mental disorders, with evidence supporting its role in preventing conditions such as depression and anxiety. A meta-analysis of 49 prospective studies, involving over 260,000 participants, found that higher physical activity levels were associated with a reduced risk of depression (odds ratio [OR] = 0.83), with this relationship remaining significant across various age groups, sexes, and geographic regions. Despite adjusting for multiple confounders, some behavioral, social, and genetic factors may still influence the results, though Mendelian randomization studies—an advanced epidemiological method—suggest stronger causal links. Two Mendelian randomization studies confirm that physical activity has a protective effect against depression, including for individuals at higher genetic risk for the condition.
Additionally, physical activity has been shown to reduce the risk of anxiety. A meta-analysis of 11 studies involving over 69,000 participants demonstrated that higher physical activity significantly lowered the risk of incident anxiety (OR = 0.74), with specific protective effects against disorders like agoraphobia and post-traumatic stress disorder (PTSD).
However, the evidence on physical activity’s protective effects against bipolar disorder and schizophrenia remains limited and inconsistent. One study found a higher likelihood of developing bipolar disorder with increased physical activity, while a Mendelian randomization study reported a protective effect. Regarding schizophrenia, a meta-analysis suggested a reduced risk of psychosis with higher physical activity (OR = 0.72), but when adjusting for confounders, the association was not significant. A Mendelian randomization

study did not support the idea that physical activity protects against schizophrenia or psychosis.

Overall, while physical activity is widely recognized for its protective effects against depression and anxiety, further research is needed to clarify its role in other mental disorders like bipolar disorder and schizophrenia (32).

Individuals who already suffer from a mental disorder

Physical activity offers substantial physical health benefits for individuals with mental disorders, including severe conditions like depression, bipolar disorder, and psychotic disorders. People with these conditions typically engage in more sedentary behavior, averaging 7.8 hours per day, and participate in significantly less moderate to vigorous physical activity compared to age- and gender-matched controls. Various factors, including male gender, unemployment, higher BMI, medication use, and lower cardiorespiratory fitness, contribute to these reduced activity levels.

Exercise interventions have been shown to improve physical health markers in people with mental disorders. For instance, individuals with depression experience reductions in body weight, BMI, and adipose tissue, while those with schizophrenia see improvements in lipid profiles, including increased HDL levels and decreased triglycerides and cholesterol. Exercise also leads to meaningful improvements in cardiovascular health, as evidenced by increases in aerobic capacity, which are linked to reductions in all-cause and cardiovascular mortality risk. Meta-analyses indicate that improvements in aerobic capacity (2.79 mL/kg/min in schizophrenia and 3 mL/kg/min in depression) correspond to significant reductions in mortality risk, underscoring the importance of physical activity in managing physical health outcomes for individuals with mental disorders (32).

7.2 Physical activity as a treatment on mental health conditions

Physical activity and exercise are increasingly recognized as effective treatments for various mental disorders, with growing support from international guidelines. For instance, the European Psychiatric Association and the Royal Australian and New Zealand College of Psychiatrists advocate for integrating exercise into mental health care, particularly for conditions like depression and schizophrenia. In addition to alleviating core symptoms, exercise has shown benefits in improving cognitive function and overall quality of life. Meta-analyses confirm that exercise significantly reduces depressive symptoms in individuals with major depression, with aerobic and mixed exercises showing superior results compared to strength training. However, strength training alone also yields moderate positive effects on depression. Moreover, exercise enhances cognitive outcomes such as memory and learning and improves both physical and psychological aspects of quality of life in individuals with depression.

Exercise also helps reduce anxiety symptoms, with moderate effects seen in people with panic disorder, generalized anxiety disorder, and post-traumatic stress disorder. In schizophrenia, exercise has shown improvements in both total and specific symptoms, including positive and negative symptoms, as well as cognitive function.

While exercise may reduce depressive symptoms in people with bipolar disorder, its effects on manic or hypomanic symptoms remain unclear, highlighting the need for further research. Additionally, physical activity interventions benefit children with attention deficit hyperactivity disorder (ADHD), improving symptoms such as anxiety, depression, social problems, and aggression, although hyperactivity and inattention symptoms show little change.

Overall, there is strong evidence supporting the inclusion of physical activity in the treatment of mental health conditions, with notable improvements in symptoms and quality of life across a range of disorders (32).

7.3 Challenges of integrating physical activity in treatment of mental diseases

Although the evidence supporting the mental and physical health benefits of physical activity for individuals with mental disorders is rapidly expanding, its integration into clinical practice remains slow. A recent survey of mental health professionals in Brazil found that over 40% never prescribed or recommended exercise to patients, with many viewing exercise prescription as the responsibility of exercise professionals such as physiotherapists. However, emerging evidence highlights the importance of a multidisciplinary approach, where all healthcare professionals, not just exercise specialists, actively recommend and support physical activity for patients with mental disorders.

Barriers to exercise in this population are both patient-specific and systemic. Physical barriers include poor health and fatigue, while psychological barriers encompass high stress, depression, and low motivation. Evidence-based strategies, such as cognitive behavioral approaches that enhance autonomous motivation, can help overcome these obstacles. Encouraging patients to identify personal reasons for exercising, aligning exercise with their life values, and avoiding external pressures like guilt are effective strategies. Additionally, addressing psychological needs related to autonomy, competence, and relatedness—through providing exercise choices, offering constructive feedback, and involving social connections—can further improve motivation.

Systemic challenges, such as limited access to exercise facilities and lack of social support, also hinder physical activity participation. To address these issues, policymakers and health services must work together to create supportive environments for exercise, considering the needs of both practitioners and consumers. Moreover, the inclusion of exercise professionals in multidisciplinary mental health teams has been shown to improve the effectiveness of exercise interventions, reduce dropout rates, and enhance outcomes. Therefore, promoting physical activity as a shared responsibility among all mental health professionals is crucial for increasing exercise uptake and maximizing its benefits for individuals with mental disorders (32).

Conclusion

Current evidence suggests that increasing physical activity at the population level could reduce the prevalence of common mental disorders, particularly depression and anxiety. People with mental disorders often experience physical health disparities, partly due to poor lifestyle choices such as low physical activity. Physical activity is a well-established protective factor against cardiometabolic diseases, and incorporating it into routine care can help mitigate these disparities while also alleviating mental health symptoms.

Promoting physical activity and exercise within mental health care is a multidisciplinary effort that requires collaboration among all mental health professionals. While exercise professionals are responsible for prescribing and supervising exercise, it is essential for all professionals to address patient-level barriers and develop strategies to overcome them. Self-determination theory provides evidence-based approaches to support patients in overcoming these obstacles.

Integrating physical activity into mental health care should go beyond focusing solely on individual behavior changes, incorporating broader improvements in service structure, delivery, and culture. To effectively translate scientific evidence into clinical practice, mental health professionals should receive basic training in physical activity prescription, and exercise experts should be trained in mental health care to contribute effectively in multidisciplinary settings.

8. Challenges and barriers to physical activity

Physical activity plays a crucial role in the prevention and management of chronic conditions such as cardiovascular diseases, diabetes, metabolic syndrome, and mental health disorders. However, despite the well-documented benefits, many individuals face significant barriers that prevent them from engaging in regular physical activity. These barriers can be patient-specific, ranging from physical limitations, psychological challenges, or lack of motivation, as well as systemic and societal, arising from fragmented healthcare systems, limited access to resources, and cultural reasons. Overcoming these challenges requires a comprehensive approach that addresses both the individual and broader systemic factors. By identifying and addressing these barriers, healthcare providers can better support patients in incorporating physical activity into their treatment plans, ultimately improving health outcomes and quality of life for individuals with chronic conditions (33).

8.1 Patient-specific barriers

Patient-specific barriers to physical activity are unique for every individual, and when it comes to conditions like cardiovascular diseases, diabetes, metabolic syndrome, and mental health disorders, these barriers can be even more pronounced. For cardiovascular diseases, common barriers include physical limitations due to symptoms like shortness of breath, fatigue, and chest pain, which discourage individuals from engaging in physical activity. However, it needs to be said that physical activity is the key of reducing these symptoms such as shortness of breath and fatigue.

For those with diabetes or metabolic syndrome, the fear of hypoglycemia (low blood sugar) can prevent them from exercising regularly. Furthermore, as studies have shown most of the individuals who suffer from these 2 conditions are more likely to be obese, this can affect their self-confidence and they might be afraid of going to the gym or running outside as they may think that others see and laugh about them.

Additionally, patients with mental health conditions, such as depression or anxiety, often face emotional barriers, including low motivation, fatigue, and a lack of energy, which make initiating or sustaining physical activity difficult. The negative impact of mental health symptoms on self-esteem and body image can also contribute to physical inactivity.

For many individuals, chronic pain, mobility issues, or other comorbid conditions add additional layers of difficulty in adhering to an exercise routine. These barriers require personalized, empathetic approaches that consider both the physical and psychological aspects of each patient's condition.

8.2 Systemic and societal barriers

Systemic and societal barriers to physical activity are deeply embedded in healthcare systems and broader social structures. In healthcare settings, there is often a lack of collaboration between mental health professionals, primary care providers, and exercise specialists. This fragmented approach can hinder the integration of physical activity into treatment plans for patients with cardiovascular diseases, diabetes, and mental health disorders. For example, physicians may not routinely prescribe exercise as part of treatment, or they may lack the resources to provide adequate referrals to exercise specialists. In the case of diabetes and metabolic syndrome, societal factors such as sedentary work environments, limited access to recreational facilities, and lack of transportation to exercise centers further prevent patients from being physically active. The cultural stigma surrounding mental health can also create barriers, as patients with mental health disorders may feel ashamed or embarrassed to participate in physical activity, especially in group settings. Additionally, public health campaigns may not effectively target at-risk populations, further marginalizing individuals with chronic diseases or mental health challenges.

8.3 Strategies for overcoming barriers

Addressing barriers to physical activity requires a multifaceted approach that includes both patient-centered and system-level interventions. For patient-specific barriers, promoting self-

determined motivation through strategies like self-determination theory (SDT) can be highly effective. This involves helping patients identify personal reasons for being active and ensuring they feel autonomous, competent, and socially connected during their physical activity. Healthcare providers should also educate patients on managing potential risks, such as controlling blood sugar during exercise for people with diabetes, and offer gradual, tailored exercise plans that consider individual limitations and preferences.

In terms of systemic and societal barriers, healthcare systems need to implement multidisciplinary approaches that include regular involvement of exercise professionals in the care team. Training mental health professionals and physicians to understand the benefits of physical activity and how to prescribe it effectively can help integrate exercise into routine care for conditions like cardiovascular diseases and diabetes.

Societal barriers can be addressed by creating more inclusive and accessible environments for physical activity, such as improving access to exercise spaces in underserved communities, promoting workplace wellness programs, and raising awareness to reduce stigma surrounding mental health and exercise. Policy-level changes, such as subsidies for fitness programs or public initiatives that increase access to exercise resources, can also have a broad impact on improving physical activity levels across all populations.

Furthermore, nowadays are many courses available which are only designed for people suffering from metabolic syndrome, these courses should become more available as individuals who participate in them may feel less ashamed and feel more comfortable in an environment where the other participants face similar challenges.

Ultimately, a combination of education, policy change, and personalized care plans is essential to overcoming the barriers that prevent individuals from engaging in physical activity and improving their health outcomes (34).

9. Counseling and advising techniques

Providing effective counseling and guidance is essential when encouraging people to become more physically active, especially those at risk for cardiovascular diseases, diabetes, metabolic syndrome, and mental health conditions. Physical activity can play a vital role in managing and preventing these health problems, but many individuals face personal challenges that make it difficult to adopt and maintain an active lifestyle. Therefore, healthcare providers must tailor their approach to meet each patient's unique needs, preferences, and obstacles.

A one-size-fits-all approach is rarely effective because every person has different physical abilities, motivations, and concerns. Some patients may struggle with a lack of time, while others may fear injury or feel unsure about how to start exercising. Mental health conditions like depression and anxiety can also reduce motivation and make physical activity feel overwhelming. By understanding these challenges and working with patients to find practical solutions, healthcare providers can make physical activity seem more achievable and beneficial.

To ensure that their advice is effective, clinicians should know different counseling techniques that encourage patients to take an active role in their health. This means not only providing information but also listening to patients, understanding their struggles, and helping them set realistic and meaningful goals. When patients feel supported and involved in decision-making, they are more likely to stay motivated and committed to improving their physical activity levels. By using a compassionate and personalized approach, healthcare professionals can empower individuals to make lasting changes that improve both their physical and mental well-being (35).

9.1 Patient-Centered approaches to Counseling

A patient-centered approach focuses on the individual, recognizing that each person knows their own life, challenges, and preferences best. Instead of simply telling patients what they should do, this approach encourages open and respectful conversations where patients feel heard and supported. It involves active listening, understanding their concerns, and working together to create a plan that fits their unique lifestyle, interests, and health conditions.

When discussing physical activity, this method ensures that recommendations are realistic and achievable. For example, a patient with a busy work schedule may find it difficult to commit to long workout sessions, so a healthcare provider might suggest short, manageable activities like taking the stairs instead of the elevator or doing quick exercises at home. Similarly, a patient who dislikes traditional workouts might be encouraged to try enjoyable activities like dancing, gardening, or playing a sport. By making physical activity fit into their daily routine, patients are more likely to stay committed in the long run.

This approach also helps patients take an active role in their health by identifying personal obstacles to exercise. Some people may struggle with motivation, while others may have physical limitations or fear injury. Through open discussions, healthcare providers can help patients find practical solutions, such as starting with light activities, joining a support group, or setting small, achievable goals.

By respecting patients' preferences and allowing them to participate in decision-making, this counseling method increases their sense of control and motivation. It not only improves adherence to physical activity recommendations but also builds confidence and long-term commitment to a healthier lifestyle.

9.2 Motivational interviewing and behavioral change models

Motivational Interviewing (MI) is a counseling method that helps people make positive changes in their lives, especially when they feel unsure or unmotivated. This approach is particularly useful for individuals with chronic health conditions such as diabetes, metabolic syndrome, and mental health disorders, where adopting a healthier lifestyle—like increasing physical activity—can greatly improve overall well-being. Instead of simply telling patients

what to do, MI focuses on having open, supportive conversations that help them discover their own reasons for wanting to be more active.

One of the key ideas behind MI is that people are more likely to commit to change when they feel that the decision is truly their own. Many individuals struggle with mixed feelings about exercise; they may know it's good for them but feel too tired, overwhelmed, or unsure about how to start. MI helps by addressing these conflicting feelings and encouraging patients to talk about what matters most to them. By focusing on their personal goals—such as having more energy to play with their children, managing stress, or preventing future health problems—patients can find stronger motivation to take action.

9.3 Tailoring advice to individual patient need

Giving personalized advice is key to helping patients stay active, especially when they have health conditions like heart disease, diabetes, or mental health challenges. Everyone has different needs, struggles, and motivations, so using a general approach often doesn't work. Instead, healthcare providers should take the time to understand each patient's unique situation and create a plan that fits their lifestyle, abilities, and goals.

When giving guidance on physical activity, it's important to consider several factors. A patient's physical condition, mental health, available support from family or friends, and personal preferences all play a role in how likely they are to stay active. For example, someone with heart disease may need to focus on gentle, low-impact exercises like walking or swimming to avoid putting too much strain on their heart. In contrast, a patient dealing with depression might struggle with low energy and motivation, so they may need encouragement to start small, like taking short walks or doing activities they enjoy.

Practical challenges also need to be addressed. Many people find it hard to exercise because they lack time, don't have access to gyms or safe outdoor spaces, or worry about getting injured. A healthcare provider can help by suggesting solutions, such as fitting in short workouts at home, finding free or affordable exercise options, or teaching ways to exercise safely. Emotional barriers, like fear of failure or past negative experiences with exercise, should also be considered. Encouraging patients to start at their own pace and celebrating small successes can help build confidence.

By giving advice that is specific to each patient's needs, healthcare professionals can create a supportive and motivating environment. This makes it more likely that patients will stick with physical activity in the long run, leading to better health and an improved quality of life.

10. Discussion

10.1 Evidence from key studies

There is strong scientific evidence showing that physical activity plays a major role in improving overall health, especially for people dealing with long-term conditions such as heart disease, diabetes, metabolic syndrome, and mental health issues. Many well-conducted studies have demonstrated that exercise can help prevent and manage these conditions by improving physical function, reducing symptoms, and enhancing quality of life. Recognizing these benefits, leading health organizations have developed guidelines to encourage people to be more active. Additionally, real-life examples of patients who have successfully improved their health through exercise further highlight the importance of making physical activity a routine part of daily life.

Important Research Studies and Large-Scale Reviews

Many studies have looked at how physical activity affects different health conditions. Research has shown that people who engage in regular physical activity have a lower risk of developing mental health issues such as depression. One major review found that individuals who were more active had significantly lower chances of experiencing depressive symptoms compared to those with a sedentary lifestyle. In another large-scale analysis, researchers found that exercise is linked to better heart health, as it helps lower cholesterol, improve blood circulation, and reduce the chances of having heart attacks or strokes.

For individuals with diabetes and metabolic syndrome, studies suggest that regular exercise can improve how the body processes sugar, helping to regulate blood glucose levels more effectively. Research reviews indicate that structured exercise programs, such as a combination of aerobic workouts and resistance training, lead to better insulin sensitivity and overall glucose control. These studies highlight why physical activity should be an essential part of managing chronic illnesses.

Guidelines from prominent organizations

Because of the well-established benefits of exercise, major health organizations have provided guidelines to help individuals maintain good health. The World Health Organization (WHO) advises that adults should aim for at least 150 to 300 minutes of moderate-intensity physical activity per week to improve overall health and prevent disease. Moderate-intensity activities include walking at a brisk pace, cycling, and swimming. For those who prefer more intense exercise, such as running or jumping rope, 75 to 150 minutes per week is recommended. WHO also suggests including muscle-strengthening exercises, like weightlifting or resistance training, at least twice a week to maintain muscle and bone health.

Similarly, the American Heart Association (AHA) has created guidelines that emphasize the importance of staying active to prevent heart disease. Their recommendations include a mix of aerobic activities to strengthen the heart and resistance exercises to support muscle and joint function. These recommendations help guide healthcare professionals in advising their patients on how to incorporate movement into their daily routines.

Case-Studies

In addition to research and guidelines, real-life success stories further show how physical activity can improve health. Many individuals with long-term conditions have experienced major improvements in their well-being after adding exercise to their routines. For example, people diagnosed with metabolic syndrome who participated in structured workout programs saw reductions in their waist size, improved blood pressure, and lower body fat. These changes not only helped them feel healthier but also reduced their risk of developing diabetes and heart disease.

Patients dealing with depression and anxiety have also benefited from regular physical activity. Studies show that those who engage in supervised exercise programs report improvements in mood, lower stress levels, and better sleep patterns. Exercise is known to

release chemicals in the brain called endorphins, which help promote feelings of happiness and relaxation. Additionally, people who participate in group activities, such as dance classes or team sports, experience social support that helps them stay motivated and feel connected to others.

Individuals recovering from heart disease also see major improvements when they follow structured physical activity programs. Many patients who have gone through cardiac rehabilitation, which includes supervised exercise, experience increased energy levels, improved heart function, and reduced risks of hospital readmission. Patients who incorporate activities such as walking, swimming, or cycling into their recovery process report feeling stronger and more capable of handling daily activities.

Final Thoughts

There is a growing body of research, official recommendations, and patient success stories that all point to the importance of staying active for long-term health. Whether it's reducing mental health symptoms, controlling blood sugar levels, or improving heart health, exercise is a powerful tool that should be used regularly. By following expert guidelines and learning from real-life examples, individuals can make informed choices about their physical activity habits, leading to better overall well-being.

10.2 Emerging trends and future directions

As the understanding of physical activity's benefits continues to grow, new strategies are being developed to encourage people to stay active, particularly those with chronic conditions such as cardiovascular disease, diabetes, and mental health disorders. Emerging trends focus on leveraging technology, strengthening community-based initiatives, and identifying areas where further research is needed to improve accessibility and long-term adherence to physical activity. Furthermore, social media platforms such as Instagram also play a key role as many athletes post their daily workout plan on their account making these plans and their motivation available for everyone in the community. Additionally, not only athletes but also cook-influencers post healthy meals and meals for conditions like diabetes available and easy to re-cook for beginners.

The Role of Technology in Encouraging Physical Activity

Technology is becoming a powerful tool in helping people stay physically active. Fitness trackers, smartwatches, and mobile apps provide real-time feedback on steps taken, calories burned, and heart rate, allowing users to monitor their progress and set achievable goals. These devices can send reminders to move, track workout sessions, and even provide virtual coaching. In addition to wearable technology, mobile apps offer guided workout plans, step challenges, and social features that allow users to connect with others for motivation and accountability.

Beyond basic tracking, newer technologies like artificial intelligence (AI) and virtual reality (VR) are being explored to create interactive exercise experiences. AI-powered apps can provide personalized fitness plans based on a user's activity level, health conditions, and preferences, while VR workouts make exercise more engaging by simulating different environments or games. These advancements can be particularly useful for individuals with mobility limitations or those who struggle with motivation. Furthermore, telehealth and remote coaching allow healthcare providers to track patients' physical activity levels and offer tailored advice, making it easier for individuals to stay on track with their fitness goals.

Community-Based Programs and Social Prescriptions

In addition to technology, community-based initiatives are becoming a key part of promoting physical activity. Many healthcare providers are now using a method called "social prescribing," where patients are referred to non-medical activities like walking groups, dance classes, or sports clubs instead of just receiving medication or traditional treatments. Similarly, there are group activities where the participants are only individuals who for instance suffer from diabetes. This approach has been particularly beneficial for individuals who feel isolated, lack motivation, or struggle to engage in physical activity on their own.

Local governments, non-profit organizations, and healthcare institutions are increasingly working together to provide free or low-cost exercise programs in parks, recreation centers, and community halls. These initiatives create a welcoming environment where people of all fitness levels can participate, receive support, and build social connections. Some programs specifically target individuals with chronic conditions, offering modified exercise plans that cater to their physical needs. Encouraging group activities, such as team sports or community yoga sessions, helps individuals feel more engaged and committed to their fitness journey.

Areas for Future Research and Improvement

Despite the progress in promoting physical activity, there are still gaps in research that need to be addressed. One major challenge is finding the most effective way to personalize exercise recommendations for different individuals. People have varying fitness levels, health conditions, and lifestyle factors that affect how they engage with physical activity, and more research is needed to develop tailored exercise programs that can be adapted to each person's needs.

Additionally, while technology has made tracking exercise easier, there is still uncertainty about its long-term effectiveness in keeping people motivated. Many individuals start using fitness apps and wearables but stop after a few weeks or months. Researchers need to explore how to make these tools more engaging over time to ensure lasting behavior change.
Another important area of research involves making physical activity more accessible to underserved populations. Some people face significant barriers, such as a lack of safe places to exercise, financial limitations, or physical disabilities. Future efforts should focus on developing policies and programs that provide equal access to exercise opportunities, regardless of a person's socioeconomic status or location.
By addressing these challenges, healthcare professionals, researchers, and policymakers can continue to refine strategies that encourage more people to stay active. The future of physical activity promotion looks promising, with new technologies, community programs, and research-driven interventions working together to make exercise a natural part of everyday life for individuals of all backgrounds.

11. Conclusion

11.1 Summary of Key Findings

This thesis has examined the important role that physical activity plays in preventing and managing various health conditions, including heart disease, diabetes, metabolic syndrome, and mental health disorders. Research has shown that regular exercise can help lower the risk of developing these conditions while also improving overall well-being. For example, structured physical activity has been found to help control blood sugar levels in people with diabetes, improve cholesterol and blood pressure in those with metabolic syndrome, and reduce symptoms of depression and anxiety.

Additionally, recommendations from global health organizations emphasize the importance of engaging in at least 150 to 300 minutes of moderate physical activity per week to maintain overall health. Despite these well-documented benefits, many people still face challenges in incorporating exercise into their daily routines. These challenges include a lack of motivation, physical limitations, and systemic barriers such as limited access to exercise facilities and a lack of professional guidance. This highlights the need for more effective strategies to promote physical activity among individuals with chronic health conditions.

11.2 Implications for Clinical Practice

For healthcare professionals, integrating physical activity into standard medical care could significantly improve patient health outcomes. However, many doctors and other medical providers do not actively encourage exercise as part of their treatment plans. This is partly because physical activity is often seen as something that falls under the responsibility of fitness professionals rather than healthcare providers. To address this issue, medical practitioners should take a more active role in encouraging patients to engage in physical activity and should provide clear guidance on how to incorporate movement into their daily lives.

One way to improve patient engagement is by using personalized counseling techniques that focus on each individual's unique needs, barriers, and motivations. Strategies such as motivational interviewing and behavioral change help people overcome challenges like low motivation, fear of injury, or a lack of time. Additionally, it is important to recognize that people with different health conditions may require different types of physical activity. For example, individuals with heart disease may need lower-intensity exercises such as walking or swimming, while those with depression may benefit more from group-based activities that provide social support.

Another key factor in improving exercise participation is the importance of teamwork among healthcare providers. Instead of leaving exercise recommendations solely to personal trainers or physiotherapists, doctors, nurses, and mental health professionals should work together to create a well-rounded approach to physical activity promotion. This means including discussions about exercise in regular medical check-ups, collaborating with fitness experts to design safe and effective exercise plans, and addressing patients' specific health conditions through tailored recommendations.

11.3 Recommendations for Healthcare Providers

To ensure that more people can benefit from physical activity, healthcare providers should take the following steps:

1. Make exercise a part of every medical consultation – Doctors and nurses should ask patients about their physical activity levels during routine check-ups and provide advice on how to stay active. Even small lifestyle changes, such as walking more or taking the stairs, can have long-term benefits.
2. Personalize exercise recommendations – Instead of giving generic advice, medical professionals should take the time to understand each patient’s physical condition,

lifestyle, and personal challenges. Some individuals may need low-impact exercises, while others may benefit from strength training or aerobic activities.

3. Encourage social and community-based exercise programs – Many people find it easier to stay active when they have social support. Healthcare providers should inform patients about local exercise groups, walking clubs, or fitness classes designed for individuals with specific health conditions.
4. Improve collaboration between medical and fitness professionals – Healthcare providers should work closely with exercise specialists to develop safe and effective exercise programs tailored to individual patient needs. This collaboration can help ensure that physical activity recommendations are both medically sound and practical.
5. Support policies that make exercise more accessible – Doctors and public health officials should advocate for more community exercise spaces, workplace wellness programs, and public health initiatives that encourage physical activity. Efforts to make exercise more affordable and available to underserved populations are also critical.
6. Educate patients about the mental health benefits of exercise – Many people associate exercise only with physical health, but it also plays a major role in improving mood, reducing stress, and preventing mental health disorders. Healthcare providers should highlight the connection between movement and mental well-being when discussing treatment options with patients.

By implementing these strategies, healthcare professionals can help bridge the gap between scientific research and real-world application. Encouraging physical activity as a routine part of healthcare can lead to improved patient health, lower disease risk, and a better quality of life for individuals with chronic conditions. Moving forward, efforts should focus on making exercise more accessible, breaking down barriers to participation, and ensuring that healthcare providers play an active role in promoting physical activity as a key component of overall wellness.

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