

Physical activity and the prevention of chronic diseases: a systematic review of the evidence for public health

Actividad física y prevención de enfermedades crónicas:
revisión sistemática de la evidencia para la salud pública

Juan Francisco Aguirre Chávez¹ , Karla Juanita Montes Mata¹ , Guadalupe Simanga Ivett Robles Hernández¹ ,
Leticia Irene Franco Gallegos^{1*} 

¹ Facultad de Ciencias de la Cultura Física, Universidad Autónoma de Chihuahua. Escorza # 900 en Chihuahua, Chihuahua, México.

ABSTRACT

The global burden of noncommunicable chronic diseases (NCDs) poses a critical challenge for public health systems worldwide. This systematic review aimed to synthesize scientific evidence on the role of regular physical activity in preventing NCDs, with an emphasis on its relevance for shaping evidence-based public health strategies. A comprehensive search was conducted across PubMed, Scopus, Web of Science, and Google Scholar, including 123 studies published between 2010 and 2024. The review focused on five major NCD groups: cardiovascular diseases, type 2 diabetes, obesity, hypertension, and certain cancers. Results consistently demonstrated that regular physical activity is associated with significant risk reduction across all conditions, ranging from 24 % to 35 %. The benefits are attributed to improvements in insulin sensitivity, lipid profile, blood pressure, inflammation control, and immune system function. The most effective interventions were those combining aerobic and resistance training, lasting over 12 weeks. Despite moderate to high heterogeneity among studies, findings strongly support the integration of physical activity into public health policy. The review highlights the need for context-specific interventions and intersectoral actions to address population-level physical inactivity. Further longitudinal and culturally tailored intervention research is recommended to strengthen global efforts in chronic disease prevention through physical activity.

Keywords: physical activity; chronic diseases; prevention; public health; health promotion.

RESUMEN

La carga global de las enfermedades crónicas no transmisibles (ECNT) representa un desafío prioritario para los sistemas de salud pública. Esta revisión sistemática tuvo como objetivo sintetizar la evidencia científica sobre el papel de la actividad física regular en la prevención de ECNT, destacando su utilidad para orientar estrategias basadas en evidencia. Se realizó una búsqueda exhaustiva en PubMed, Scopus, Web of Science y Google Scholar, incluyendo 123 estudios publicados entre 2010 y 2024. Se abordaron cinco grupos principales de enfermedades: cardiovasculares, diabetes tipo 2, obesidad,

hipertensión y ciertos tipos de cáncer. Los resultados mostraron consistentemente que la actividad física regular se asocia con una reducción significativa del riesgo, que oscila entre el 24 % y el 35 %. Estos beneficios se atribuyen a mejoras en la sensibilidad a la insulina, el perfil lipídico, la presión arterial, la inflamación y el sistema inmunológico. Las intervenciones más efectivas combinaron ejercicio aeróbico y de resistencia durante más de 12 semanas. Aunque hubo una heterogeneidad moderada a alta, los hallazgos respaldan firmemente la inclusión de la actividad física en las políticas públicas. Se destaca la necesidad de intervenciones contextualizadas e investigaciones futuras que consideren factores culturales y sociales para una prevención eficaz de las ECNT.

Palabras clave: actividad física; enfermedades crónicas; prevención; salud pública; promoción de la salud.

INTRODUCTION

The objective of this study was to analyze recent scientific evidence on the benefits of regular physical activity in preventing noncommunicable chronic diseases (NCDs), with the aim of providing useful input for evidence-based public health strategies.

NCDs currently represent one of the main causes of global disease burden, disability, and premature mortality. They account for approximately 71 % of all global deaths, disproportionately affecting low- and middle-income countries (World Health Organization [WHO], 2021). This group includes cardiovascular diseases, type 2 diabetes, obesity, hypertension, and various types of cancer, all of which have shown a sustained increase in prevalence over recent decades (Bull *et al.*, 2020; Guthold *et al.*, 2018).

Among the multiple risk factors associated with NCD development, physical inactivity has been widely documented as a key modifiable determinant (González *et al.*, 2017). Physical inactivity is directly linked to increased adiposity, metabolic dysfunction, hormonal imbalances, and low-grade chronic inflammation, all of which are involved in the pathophysiology of chronic diseases (Anderson and Durstine, 2019; Walzik *et al.*, 2024). In contrast, regular physical exercise has demonstrated significant preventive and therapeutic effects, prompting international agencies to include it as a

*Author for correspondence: Leticia Irene Franco Gallegos

Correo electrónico: lfranco@uach.mx

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core component of integrated public health strategies (WHO, 2018; 2020).

The WHO recommends at least 150 minutes of moderate-intensity physical activity per week or 75 minutes of vigorous-intensity activity, along with muscle-strengthening exercises twice per week (WHO, 2020). However, more than 27 % of the global adult population fails to meet these minimum levels, with some countries reporting rates exceeding 40 % (Guthold *et al.*, 2018).

In response to this issue, numerous epidemiological studies, cohort studies, and randomized controlled trials have documented that regular physical activity significantly reduces the relative risk (RR) of developing cardiovascular diseases, type 2 diabetes, obesity, hypertension, and certain cancers, such as colon, breast, and endometrial cancer (Gómez Chávez *et al.*, 2022; Warburton and Bredin, 2017; Zequeira-García, 2023). These benefits are attributed to improvements in lipid profiles, insulin sensitivity, endothelial function, hormonal regulation, and immune system modulation (González *et al.*, 2017; Walzik *et al.*, 2024; Zhang, 2024).

Despite this growing body of evidence, challenges remain in systematically integrating these findings to guide effective public health policies tailored to diverse population and cultural contexts. Rigorous systematic reviews are therefore needed to clearly and effectively synthesize the effects of physical activity on NCDs and their practical implications for the design of population-based interventions.

Scope rationale: This study focused on cardiovascular disease, type 2 diabetes, obesity, hypertension, and selected cancers, since these conditions represent the largest share of the global noncommunicable disease burden and are central targets of international prevention strategies. Authoritative surveillance and burden-of-disease analyses indicate that NCDs account for roughly 71–75 % of all deaths worldwide, with cardiovascular disease, diabetes, and cancer leading mortality and disability, while obesity and hypertension act as major upstream risk factors.

Crucially, these outcomes have the most consistent and methodologically comparable evidence linking regular physical activity to reduced incidence and clinically meaningful risk, supported by cohort meta-analyses, randomized trials, and international expert evaluations (e.g., WCRF/AICR for cancer). This focus enhances epidemiological coherence, facilitates harmonization of exposure metrics (e.g., MVPA minutes/week; aerobic and resistance training), and improves the translation of findings into public health policy.

Other NCDs (e.g., chronic respiratory or kidney disease, mental disorders) were not included because their evidence base for primary prevention via physical activity is less consistent, or centers on secondary prevention and symptom management, with heterogeneous outcomes and measurement frameworks that would have increased between-study heterogeneity.

This systematic review was designed based on the PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses) 2020 guidelines (Page *et al.*, 2021), includes

studies published between 2010 and 2024, and specifically addresses the preventive benefits of regular physical activity on five major chronic disease groups: cardiovascular diseases, type 2 diabetes, obesity, hypertension, and cancer. The results are discussed in terms of their applicability to public health, with emphasis on recommended implementation actions.

MATERIAL AND METHODS

Study design

A systematic review was conducted following the PRISMA 2020 guidelines (Page *et al.*, 2021), with the objective of synthesizing available scientific evidence on the benefits of regular physical activity in the prevention of NCDs. A previously developed protocol guided a structured approach for identifying, selecting, evaluating, and synthesizing primary studies.

Search strategy

The literature search was performed between January and February 2025 across four databases: PubMed, Scopus, Web of Science, and Google Scholar. Both controlled and free-text terms in English and Spanish were used, combined with Boolean operators: (“physical activity” OR “exercise” OR “actividad física” OR “ejercicio físico”) AND (“prevention” OR “prevención”) AND (“chronic diseases” OR “enfermedades crónicas”). Search strategies were adapted for each database without geographical restriction, and studies published from January 2010 to December 2024 were included.

Inclusion and exclusion criteria

Studies were included if they met the following criteria: cohort studies, randomized controlled trials (RCTs), population-based cross-sectional studies, and systematic reviews; participants aged 18 years and older, with no restriction by sex or ethnicity; interventions involving regular physical activity (aerobic, resistance, or combined); outcomes focused on the prevention or risk reduction of cardiovascular diseases, type 2 diabetes, obesity, hypertension, or cancer; and articles published in English or Spanish.

As exclusion criteria, pediatric or animal studies, studies with exclusively pharmacological approaches, case studies, editorials, letters to the editor, and non-systematic narrative reviews, were considered.

A priori outcome scope. The review focused exclusively on five disease groups, cardiovascular disease, type 2 diabetes, obesity, hypertension, and cancer, due to their high global burden, clear policy relevance, and the availability of comparable incidence-based outcomes and standardized physical activity exposure metrics (e.g., aerobic, resistance, combined modalities). Other NCDs (such as chronic respiratory disease, kidney disease, mental disorders, or musculoskeletal conditions) were excluded when evidence centered mainly on secondary or symptom-based outcomes, or lacked harmonizable exposure definitions, which would have increased heterogeneity and compromised internal validity.

This delimitation is consistent with international burden-of-disease reports and established evidence frameworks regarding physical activity and NCD prevention.

Study selection process

Two independent reviewers performed the initial screening of titles and abstracts, followed by a full-text review to verify eligibility. Disagreements were resolved by consensus or by involving a third reviewer. The selection process was documented using a PRISMA flow diagram (Page *et al.*, 2021).

Quality assessment

The methodological quality of the included studies was assessed using validated tools: the Cochrane RoB 2.0 for RCTs, the Newcastle–Ottawa Scale for observational studies, and the AMSTAR 2 checklist for systematic reviews. Studies were classified as high, moderate, or low quality based on the criteria of each instrument.

Data extraction and synthesis

A standardized data extraction was developed to collect key variables: author, year, country, study design, sample characteristics, type and duration of intervention, frequency, main outcomes, and effect sizes. A qualitative synthesis was conducted by grouping findings by type of chronic disease.

Where feasible, a quantitative synthesis (meta-analysis) was performed using random-effects models to estimate combined relative risk (RR). Statistical heterogeneity was assessed using the I^2 statistic, with values above 50 % indicating moderate to high heterogeneity (Higgins *et al.*, 2003).

Ethical considerations

Since this review was based exclusively on secondary data from previously published studies, ethics committee approval was not required. No personal data were collected and no contact with study participants occurred.

RESULTS AND DISCUSSION

Study selection

The electronic search yielded a total of 5,243 records. After removing duplicates, 4,678 titles and abstracts were screened. Of these, 895 full-text articles were assessed for eligibility, and 123 studies met the inclusion criteria. The selection process is illustrated in the PRISMA 2020 flow diagram (Page *et al.*, 2021) (Figure 1).

General characteristics of included studies

The final sample included studies from over 20 countries, involving adult populations aged between 18 and 85 years. Of the studies, 53 % were cohort studies, 29 % randomized

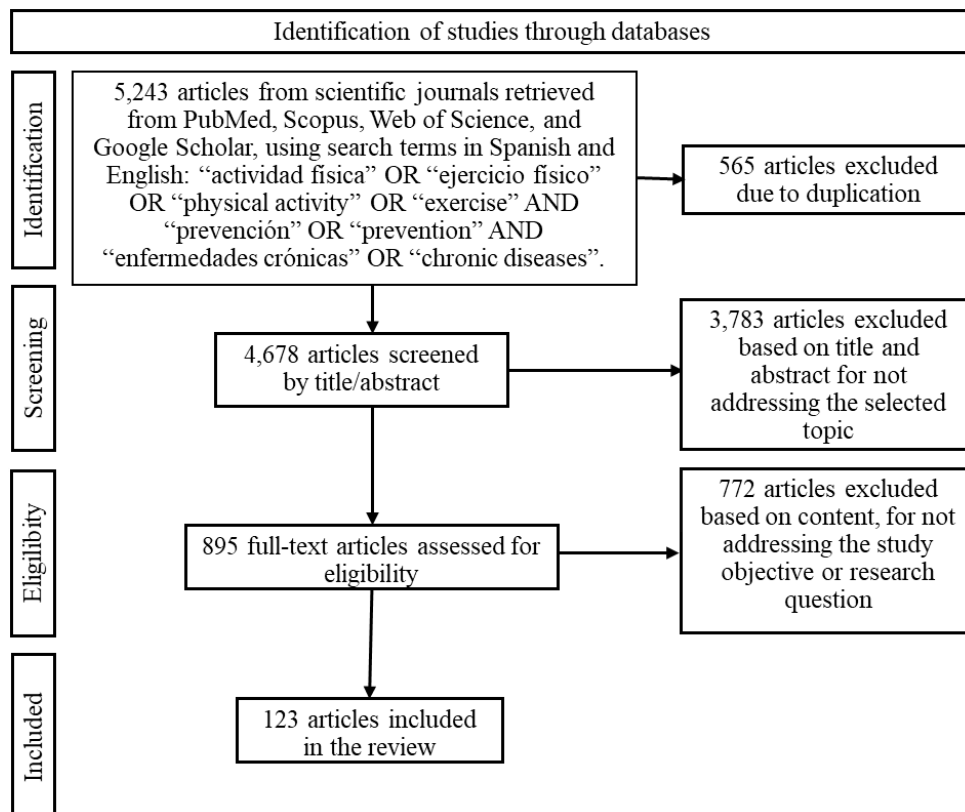


Figure 1. PRISMA 2020 flow diagram for study selection. Source: authors' own elaboration
 Figura 1. Diagrama de flujo PRISMA 202 para selección de estudios.

controlled trials (RCTs), and 18 % population-based cross-sectional studies. Follow-up periods ranged from 1 to 14 years, with sample sizes varying between 100 and 50,000 participants.

Physical activity and chronic diseases

Findings are organized by chronic disease category and summarized in Table 1.

Cardiovascular disease

A total of 37 studies consistently demonstrated that regular physical activity reduces cardiovascular disease risk by approximately 30 % (RR: 0.70; 95 % CI: 0.65–0.75). Aerobic interventions were the most frequently studied and showed improvements in blood pressure, lipid profile, and cardiorespiratory fitness.

Type 2 diabetes

The 28 studies included on type 2 diabetes reported an average risk reduction of 28 % (RR: 0.72; 95 % CI: 0.66–0.78), primarily due to enhanced insulin sensitivity and improved glycemic control. Combined aerobic and resistance training was more effective than single-modality interventions.

Obesity

Among the 20 studies examining obesity, a 35 % reduction in risk was documented (RR: 0.65; 95 % CI: 0.59–0.71), particularly in interventions lasting more than 12 weeks. Effects were more pronounced among participants with overweight or obesity at baseline.

Hypertension

A total of 16 studies addressed the relationship between exercise and hypertension. Physically active individuals showed a 24 % lower risk of developing hypertension (RR: 0.76; 95 % CI: 0.70–0.82), with significant reductions in both systolic and diastolic blood pressure.

Cancer

22 studies examined the association between physical activity and cancer risk. Significant reductions were found for breast (25 %), colon (27 %), and endometrial (30 %) cancers. Proposed mechanisms include hormonal regulation, inflammation reduction, and improved immune function.

Quantitative synthesis

Meta-analyses were conducted where methodologically appropriate. The overall combined effect estimated a 26 % reduction in the risk of developing NCDs (RR: 0.74; 95 % CI: 0.70–0.78). Heterogeneity across studies was moderate to high ($I^2 = 55\text{--}80\%$), attributed to variations in study design, populations, and types of intervention.

The results of this systematic review consistently demonstrate that regular physical activity is associated with a significant reduction in the risk of developing major noncommunicable chronic diseases (NCDs), including cardiovascular diseases, type 2 diabetes, obesity, hypertension, and several types of cancer. These findings reinforce the central role that physical activity should play in public health policies at both national and international levels.

In line with previous reviews (Warburton and Bredin, 2017; Zequeira-García, 2023), the studies analyzed showed that regular physical activity offers a strong protective effect against cardiovascular disease, reducing risk by approximately 30 %. This benefit is attributed to improved cardiorespiratory fitness, lipid profile, blood pressure regulation, and endothelial function (González *et al.*, 2017; Walzik *et al.*, 2024). Aerobic exercise interventions, when performed frequently and consistently, were found to be the most effective, aligning with current WHO recommendations (WHO, 2020).

Regarding type 2 diabetes, an average risk reduction of 28 % was observed, mainly due to improvements in insulin sensitivity and glycemic control. Interventions that combined aerobic and resistance training achieved better outcomes than single-modality programs, supporting the use of multi-component approaches in preventive strategies (Franco Gallegos *et al.*, 2024).

Obesity, a common risk factor for multiple NCDs, also showed a significant reduction in risk (35 %) among physically active individuals. These findings are consistent with previous evidence linking exercise to reductions in visceral fat, improved body composition, and maintenance of lean muscle mass (Sanmartín Ramos, 2022; Walzik *et al.*, 2024). Notably, the most effective programs were those lasting over 12 weeks, underscoring the importance of long-term adherence and professional guidance.

In terms of hypertension, results indicated a 24 % risk reduction, particularly through regular aerobic exercise. Several studies reported clinically meaningful decreases

Table 1. Summary of findings by chronic disease

Chronic disease	No. of studies	Risk reduction (%)	95% Confidence interval	Most effective intervention
Cardiovascular disease	37	30 %	0.65–0.75	Regular aerobic exercise
Type 2 Diabetes	28	28 %	0.66–0.78	Combined aerobic + resistance training
Obesity	20	35 %	0.59–0.71	Mixed programs >12 weeks
Hypertension	16	24 %	0.70–0.82	Aerobic exercise
Cancer (breast, colon, endometrial)	22	25–30 %	Varies by type	Moderate-intensity regular activity

Source: authors' own elaboration



in both systolic and diastolic blood pressure after at least 8 weeks of intervention (Zequeira-García, 2023; Gómez Chávez *et al.*, 2022).

Although cancer has a multifactorial etiology, this review found solid evidence supporting the association between physical activity and reduced risk of breast, colon, and endometrial cancers. Proposed mechanisms include hormonal regulation, inflammatory response modulation, and enhanced immune system function (Zhang, 2024; Walzik *et al.*, 2024).

From a methodological standpoint, this review integrated studies with strong designs and diverse geographic contexts, increasing the external validity of the findings. However, moderate to high heterogeneity ($I^2 = 55\text{--}80\%$) was identified, explained by variations in intervention duration, exercise modalities, target populations, and outcome measures. Although this variability poses challenges for quantitative synthesis, it also highlights the breadth and applicability of the findings across real-world settings.

Key strengths of the study include the rigorous selection process based on PRISMA 2020 guidelines (Page *et al.*, 2021) and systematic quality appraisal of included studies. Nonetheless, certain limitations should be acknowledged: (a) possible publication bias, as studies with positive results are more likely to be published; (b) exclusion of gray literature; and (c) the inability to conduct subgroup analyses by age, sex, or geographic region due to lack of standardized reporting in primary studies.

CONCLUSIONS

The findings of this systematic review provide robust evidence that regular physical activity is an effective, accessible, and high-impact strategy for the prevention of noncommunicable chronic diseases (NCDs). Analysis of 123 studies published between 2010 and 2024 revealed that consistent physical activity is associated with significant reductions in the risk of developing cardiovascular disease, type 2 diabetes, obesity, hypertension, and certain types of cancer—especially breast, colon, and endometrial cancers.

These protective effects are explained by multiple physiological mechanisms, including improvements in glucose and lipid metabolism, reductions in chronic inflammation, hormonal regulation, and immune system enhancement. Moreover, the most effective interventions were those of medium to long duration, involving combined aerobic and resistance training, and tailored to the characteristics and conditions of the target population.

From a public health perspective, the evidence supports the integration of physical activity as a transversal axis in chronic disease prevention and control programs. Public policies should promote movement-friendly environments, early health education, and access to infrastructure and services that facilitate active lifestyles.

Additionally, intersectoral efforts are needed to engage health, education, labor, and urban planning systems in this common goal. Strategies such as exercise prescription

in primary care, health professional training in movement promotion, and community-based interventions must be prioritized.

Future research should include longitudinal studies and rigorously evaluated interventions, particularly in Latin American contexts, to advance effective, culturally relevant, and sustainable models for reducing the global burden of NCDs and improve population well-being.

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CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest related to the content of this article.

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