Vol. 11, No. 1, 2026, pp. 213-237
DOI: https://doi.org/10.29210/30036852000

Contents lists available at Journal ELORA

JRTI (Jurnal Riset Tindakan Indonesia)
ISSN: 2502-079X (Print) ISSN: 2503-1619 (Electronic)

Journal homepage: https://jrti.eloracenter.org/jrti

Home-based and digitally delivered exercise interventions for blood pressure management in adults with hypertension: a systematic review (2021–2026)

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Article Info

Article history:

Received Jun 19th, 2026
Revised Jun 24th, 2026
Accepted Jun 24th, 2026

Keywords:

Home-based exercise
Hypertension
Blood pressure
Telerehabilitation
Exercise intervention

ABSTRACT

High blood pressure is still a major risk factor that can be changed for heart problems and early death. This systematic review of literature combined the latest evidence on home-based exercise interventions for blood pressure management in adults by looking at different modalities, effects on systolic and diastolic blood pressure, features of a programme that make it effective, and the use of digital delivery technologies. The review used the PRISMA 2020 method. A carefully organized search of Scopus came up with 1858 records. After taking out 3 duplicates, 1855 records were first checked by title and abstract. 126 full-text reports were retrieved for eligibility check. 74 studies have met the inclusion criteria after full-text reading and were included in the qualitative synthesis. Eligible studies enrolled adults with hypertension or elevated blood pressure undergoing home-based or tele-delivered exercise and reporting systolic and/or diastolic outcomes. Methodological adequacy was appraised with the FICO framework. Because of marked heterogeneity in dosing and outcome ascertainment, findings were integrated through thematic synthesis rather than meta-analysis. Four set of main results were drawn. Firstly, aerobic and combined aerobic-resistance exercises were the most prescribed ones, while isometric and mind-body methods displayed differential effects but consistent benefits. Secondly, most controlled studies demonstrated that both systolic and diastolic blood pressure levels were clinically significantly lowered when compared to usual care. Thirdly, the changes seen with exercise were dependent on exercise intensity, frequency, and time as well as adherence that stood out from others, with supervision a d digital monitoring as important moderators. Fourthly, digitally and tele-delivered programmed formed a sizeable part of the evidence and were often used in cardiac, renal, oncological, and metabolic populations. Generally, home-based exercise seems to be an effective addition to managing antihypertensive treatment although further work is required to standardise the prescription of exercise, to find objective ways to measure adherence, and to do long-term studies involving populations from diverse backgrounds.

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Introduction

Raised blood pressure is one of the top cardiovascular risk factors globally. It not only leads to various heart and brain-related diseases but also leaves a big and ever-growing impact on health systems (Ruberti et al., 2021; Mediano et al., 2023; Kim et al., 2025). Since blood pressure and blood vessel damage risks are directly proportional, even small reductions in blood pressure at the community level can result in worthwhile decreases in heart-related diseases (Isakadze et al., 2024; Eser et al., 2026). Among the different options, changing the lifestyle, with focus on exercise, stands out as a great way to affect several disease mechanisms at once such as improving how the blood vessels work, balancing the nervous system, and bettering one's weight (Cai et al., 2022; Zupkauskiene et al., 2023). The fact that exercise can be considered a first-line treatment option that is affordable led to in-depth research in this field including identifying the best ways, places, and people for delivering it to adults who already have or are likely to develop high blood pressure.

Although there is a strong body of evidence suggesting that structured exercise can reduce blood pressure, converting the clinical efficacy into a lasting real-world impact is still a challenge. Supervised, facility-based exercise programs do yield excellent physiological outcomes but they are hindered by the issues of traveling, scheduling, staffing costs and attrition. Further, these challenges tend to affect older adults and patients with chronic diseases to a greater extent (Brickwood et al., 2021; Sian et al., 2022). As a result, home-based programs have been proposed as a more practical alternative that not only reduces the barriers to accessing the facilities but also helps in making physical activity a part of the day-to-day life (Cruz-Cobo et al., 2024; Mclaughlin et al., 2023). Nevertheless, the move away from direct supervision raises several issues such as whether it is still possible to achieve the same level of blood-pressure reduction, how the exercise prescription should be made in unsupervised settings, and how adherence can be ensured when participants are exercising alone (Sinclair et al., 2023; Vendetti et al., 2023).

A large proportion of primary studies has been focused on the relationship between exercise and blood pressure in various groups and types of exercise. Of all exercises, aerobic training has the longest supportive record of evidence, but resistance, combined, isometric and mind-body exercises have all been tested, most of the time after having positive effects on the resting blood pressure (Cai et al., 2022; Li et al., 2022; Ruberti et al., 2021). Studies are progressively covering not only healthy hypertensive adults but also clinical groups in whose cases blood pressure control is of paramount concern such as patients going through cardiac rehabilitation, persons with chronic kidney disease, and cancer survivors (Anand et al., 2021; Battaglia et al., 2024; Yan et al., 2024). This variety not only reveals the capability of exercise as a treatment method but also, on the other hand, makes the assembly of results more difficult since populations, comparators, and definitions of outcomes differ greatly in the literature.

A standout characteristic of the latest research is the incorporation of digital and telehealth technologies in home-based exercise. Mobile applications, wearable sensors, video-supervised sessions, and web platforms have become the standard tools to prescribe, monitor, and modify training remotely and also provide behavioral support that was formerly only accessible face to face (Zhong et al., 2023a; Vozzi et al., 2022; Lai et al., 2024). These instruments potentially can reach a great number of people and give them ongoing feedback. Indeed, some interventions have integrated participants' self-monitoring of blood pressure as part of their experience (Isakadze et al., 2024; Cruz-Cobo et al., 2024). The speedup of remote care during the COVID-19 era and afterwards further solidified these methods, which is why digitally mediated home exercise is no longer just a marginal innovation but rather a significant body of evidence (Brickwood et al., 2021; Hyodo et al., 2023).

However, evidence for home-based delivery has not been thoroughly mapped despite this growth. Many reviews combine supervised and unsupervised programs, so it is unclear whether the home environment lessens or maintains the blood pressure lowering effect, which specific modalities are better for performing independently (Mclaughlin et al., 2023; Roxburgh et al., 2023). This leads to uncertainty not only about which prescriptions can be recommended for home delivery by... and also little clarity as to how the home setting might influence intensity, frequency, and supervision (Sinclair et al., 2023; Danielsen et al., 2023). Consequently, an in-depth review, which singles out home-based and remote interventions, is necessary to guide the...

Methodological and reporting heterogeneity are a second source of limitations. Through the articles, intervention dose is very often not described, adherence is mostly self-reported or totally omitted, and outcome ascertainment is from clinic readings to ambulatory monitoring, which record very different things, so that it becomes very difficult to compare and pool (Vendetti et al., 2023; Lavín-Pérez et al., 2023).In fact, a lot of very promising initiatives are given in the form of protocols or pilot and feasibility studies, the authors stating that the final effect has not yet been confirmed, and special populations are sometimes studied using a very small number of samples (Lai et al., 2022; Rahman et al., 2023; Crepaldi et al., 2023). These aspects greatly limit the

power of any reasoning that can be presently carried out, and point out that methodological consolidation is required quite urgently (Battaglia et al., 2024; Mura et al., 2025).

It would be right on time as well as very much needed to summarize the recent, rapidly growing, and technologically distinct publications on home-based exercise that, reflect this. As such, the present publications are large enough to support a structured synthesis but also varied enough that their practical implications are not straightforward, and decision-makers are in need of a clear explanation of what works, for whom, and under which delivery conditions (Eser et al., 2026; Wan et al., 2026). Systematic mapping that classifies these modalities, summarizes the effects on blood pressure, identifies the characteristics linked to benefit, and assesses the role of digital delivery can transform a fragmented evidence base into actionable guidance (Zupkauskiene et al., 2023; Kim et al., 2025).

Having done the health-in-home actions survey, the authors move further and try to identify clinical outcomes associated with these initiatives via a systematic review and meta regression of existing research. Research question 2 (RQ2) delves into what impact home-based exercise has on systolic and diastolic blood pressure in adults with hypertension. By evaluating the consistency and trends of effects reported both in controlled and single-arm studies, this question yields an evidence-based judgement on whether home delivery maintains the antihypertensive effect of exercise that is well documented for supervised sessions. Lastly, the review gets the benefit delivery and potential benefit factors at home interventions under the microscope. Altogether, these interrogations serve to present a set of guidelines for practical implementation and at the same time show how the home-exercise research aligns with the overall shift in cardiovascular care towards a digitally enabled model. The review paper first briefly summarizes the findings from the survey of health- n-home/in-home interventions, and then complements it with a systematic review of meta regression analyses to identify what clinical outcomes these initiatives are associated with. To address these gaps, we conducted a systematic literature review, reported per PRISMA 2020, that isolates home-based and tele-delivered exercise from supervised, facility-based programmes. Findings were integrated through thematic synthesis to answer four research questions (RQ1–RQ4) concerning intervention types, blood-pressure effects, programme characteristics associated with benefit, and the role of digital delivery.

This review aims to identify and describe the types of home-based exercise interventions that have been implemented for blood pressure management in adults with hypertension. Furthermore, it seeks to examine the effects of these interventions on systolic and diastolic blood pressure, determine which intervention characteristics including type, frequency, intensity, duration, and adherence are associated with the greatest improvements in blood pressure outcomes, and explore the role of digital and tele-delivery technologies in supporting the implementation and effectiveness of home-based exercise interventions for blood pressure management.

Method

Research Design and Framework

A systematic literature review (SLR) was used since the research questions called for a thorough, transparent, and reproducible assessment of a well-defined set of evidences but not a selective presentation of literature. The SLR approach has become a standard way of reducing the potential for bias in the selection of studies and allowing anyone to follow the review process through making each step of the search, screening, and synthesis explicit (Tranfield, Denyer, & Smart, 2003). Both the reporting and conduct stages were consistent with the typical ways of systematic reviews of healthcare interventions (Liberati et al., 2009), and the review was in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines that list what must be reported for transparent and full disclosure of the review and also organize the flow of records from identification to screening, eligibility, and inclusion (Page et al., 2021). PRISMA 2020 was chosen instead of earlier versions because it supports current searching and reporting methods and offers a revised flow chart format (Moher et al., 2009; Page et al., 2021).

Search Strategy

The literature search combined three thematic blocks-exercise, home or remote setting, and blood pressure or hypertension-which were further linked by Boolean operators and searched in the title, abstract, and keywords. Truncation (the asterisk) was used to capture morphological variants (e.g. hypertens* retrieves both hypertension and hypertensive), and quotation marks were used to ensure the exact phrase matching. The TITLE-ABS-KEY field code was used to restrict the matches to the most informative metadata fields. The string below represents the search logic executed in Scopus.

((hypertension) AND ("home-based exercise" OR "home exercise") AND ("blood pressure"))

Limiters were then applied within Scopus to restrict the export to peer-reviewed journal articles published in English between 2021 and 2026, within health- and exercise-related subject areas. These limiters operationalise the eligibility criteria at the database level and were applied prior to export, so that the title-and-abstract screening stage subsequently addressed the substantive reduction of records against the full eligibility criteria.

Database and Information Sources

For this review, Scopus was chosen as the single main and reliable source of information. Its selection was based on its extensive coverage of biomedical, sport-science, and rehabilitation journals, as well as its ability to provide well-organized, exportable metadata. The search was carried out, and the metadata was exported on 16 June 2026. No additional databases, registries, or grey-literature sources were consulted. The authors recognize the decision not to use other sources as a limitation of this study. All the bibliographic data that have been analyzed in this review authors, titles, source titles, years, and digital object identifiers have come straight from the Scopus export.

Eligibility Criteria

Eligibility was set by using a PICOS framework and was made practical through very specific inclusion and exclusion criteria (Table 1). Studies could be included if the participants were adults diagnosed with hypertension or had elevated blood pressure (it could also be clinical populations where blood pressure control is the main outcome), the study implemented a home-based or remotely delivered exercise program, and the results included blood pressure levels, either systolic, diastolic, or both.

Table 1 <Eligibility Criteria and PICOS Framework for Study Selection>

Criterion	Inclusion	Exclusion
Population (P)	Adults (≥18 y) with hypertension or elevated/at-risk blood pressure, including clinical populations (cardiac, renal, metabolic, oncological)	Children/adolescents; samples without blood-pressure relevance
Intervention (I)	Home-based or remotely/tele-delivered exercise (aerobic, resistance, combined, isometric, mind-body, HIIT)	Exclusively supervised center/facility-based exercise; non-exercise interventions
Comparator (C)	Usual care, no exercise, waitlist, or supervised/alternative exercise	Not applicable to single-arm designs (retained if I and O met)
Outcome (O)	Systolic and/or diastolic blood pressure (primary); secondary cardiometabolic/fitness outcomes	No blood-pressure outcome reported
Study design (S)	RCTs, quasi-experimental, cohort, pilot/feasibility, and registered protocols	Editorials, commentaries, conference papers, book chapters
Language	English	Non-English
Document type	Journal article	Conference paper, book chapter, editorial, note
Publication period	2021-2026	Before 2021
Accessibility	Indexed full record available in Scopus	Record not retrievable for screening

Study Selection Process

Selection was done in a series of steps following PRISMA 2020. Initially, duplicate records were removed. Then, the remaining records were used for title and abstract screening based on the eligibility criteria. Records passing this stage were checked at full-text level to confirm the final eligibility. At the full-text stage, records were excluded for the following reasons: no exercise intervention was included, no blood-pressure outcome was reported; the record was an editorial, commentary, conference paper, or book chapter; the record was not published in English; the record could not be retrieved for screening. Predefined criteria in Table 1 were used to make screening decisions. Where eligibility was unclear, records were kept for the next stage to avoid early exclusion. Final decisions were made by consulting the full set of criteria.

Quality Assessment - FICO Framework

The methodological adequacy of included studies was appraised using the FICO framework, which scores four dimensions: Focus (clarity and appropriateness of the research aim and population), Information (adequacy of the methods, sample, and intervention description), Context (appropriateness of design and comparators for the question), and Outcome (validity and completeness of blood-pressure measurement and reporting). Each dimension was rated on a 0-2 scale (0 = absent/unclear, 1 = partial, 2 = adequately addressed), yielding a maximum of 8 points. Studies scoring ≥4 was retained for synthesis. As a supplementary check for randomized designs, risk of bias was considered in line with established trial-appraisal guidance (Sterne et al., 2019). The

appraisal was used to weight the confidence attached to findings during synthesis rather than as an additional exclusion filter beyond the eligibility criteria. Screening and extraction followed a piloted form against the a priori criteria in Table 1. Scopus was selected as a single source because its structured, fully exportable metadata enabled both eligibility screening and the descriptive bibliometric mapping; reliance on one database is acknowledged as a limitation.

Data Extraction Procedure

A standardized extraction template was utilized for each included study to record authorship, publication year, study location (where available), study design, sample, exercise modality and delivery technology, outcome measures, and main blood-pressure results. Authors, years, source titles, and digital object identifiers were taken from the Scopus export without any changes. Study design, modality, sample size, and outcome statements were taken from the indexed abstracts and titles. Study country/affiliation was not a field in the Scopus export used for this review; location was therefore recorded only where explicitly stated within an abstract and is otherwise reported as "not specified in source export." Extracted data populate the descriptive tables presented in Table 2.

Network and Bibliometric Analysis Methodology

Besides thematic synthesis, descriptive bibliometric methods were also used on the publications involved in the research. The number of publications was summed up over the years and delivery modes to illustrate the time trends, while author-provided keywords were assessed for co-occurrence frequency to highlight the leading conceptual groups. Keyword counting was performed after the elimination of general indexing descriptors (e.g., "humans, " "female, " "adult") to hold the main terms only. These analyses are purely descriptive and exploratory in nature; they were intended to depict the structure of the domain and to corroborate the qualitative themes, rather than substantiate any inferential assertions. The distributions obtained are shown as Figures 2-5.

Data Analysis and Synthesis

Due to the variation in designs, populations, and outcomes reporting, a thematic synthesis was done. This followed the inductive, three-stage approach of 'free-line coding, ' creating 'descriptive themes, ' and then 'analytical themes' (Thomas & Harden, 2008). The results of each research were coded in view of the research questions; these codes were then clustered into 'descriptive themes' (e.g. modality, dose, adherence, delivery technology, and population) which were further 'analytical themes' aligned with RQ1-RQ4. Themes were verified against the original records to ensure accuracy, and different or conflicting findings were kept and studied rather than ignored. The quantitative meta-analysis was not conducted because the outcome measures and results reporting were very diverse and could not be pooled reliably.

PRISMA 2020 Flow Diagram

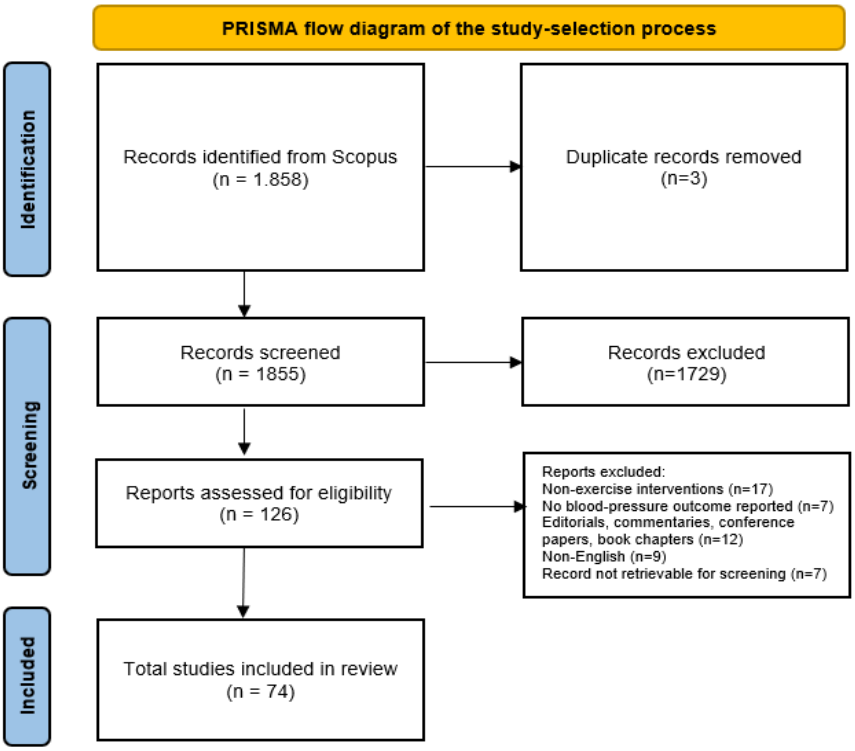

Figure 1 <PRISMA Flow Diagram of the Study-selection Process>

Figure 1 presents the flow of records through identification, screening, eligibility, and inclusion, following the PRISMA 2020 flow-diagram template (Page et al., 2021). The diagram reports the initial Scopus yield, the records removed before screening, the records excluded at title/abstract screening and at full-text eligibility with reasons, and the final number of studies included in the qualitative synthesis.

Reporting and Documentation

The review was done and written following the PRISMA 2020 checklist guidelines, and the record flow through the review is illustrated by the PRISMA 2020 flow diagram (Figure 1) (Page et al., 2021). All the numbers mentioned in the abstract, methods, and results sections perfectly match the diagram. Bibliographic reliability was ensured by limiting authors, titles, journals, years, and identifiers to those found in the Scopus source export.

Results and Discussions

Study Selection Results

The structured Scopus search identified 1,858 records. After the removal of 3 duplicate records, 1,855 records remained and were screened by title and abstract. At this stage, 1,729 records were excluded because they did not meet the eligibility criteria, leaving 126 reports for assessment at full-text level. Of these, 52 were excluded for the following reasons: no exercise intervention (n = 17), no blood-pressure outcome reported (n = 7), editorials, commentaries, conference papers, or book chapters (n = 12), non-English records (n = 9), and records not retrievable for screening (n = 7). Seventy-four studies satisfied all eligibility criteria and were carried into the qualitative synthesis. These figures correspond exactly to the PRISMA 2020 flow presented in Figure 1 (Page et al., 2021).

Descriptive Characteristics

The 74 included studies were published between 2021 and 2026, confirming the recency of the evidence base. Controlled and interventional designs predominated: 25 were randomized controlled trials and 8 were registered randomized protocols, alongside quasi-experimental and single-arm interventional studies, a small number of cohort and pilot/feasibility studies, and one review. Delivery was skewed toward digitally or tele-delivered programmes (n = 45) relative to conventional home programmes (n = 29), with digital delivery increasing in relative share across the period. Study location was reported within the abstract for 20 of the 74 studies and was otherwise not available in the Scopus export; reported locations are summarized in Figure 3 and recorded as "NS" (not specified in source export) in Table 2 where applicable. Table 2 summarizes every included study, and Table 3 classifies each by design, theme, and intervention. Figures 2-5 depict, respectively, the temporal trend by delivery mode, the reported study locations, the author-keyword co-occurrence structure, and the distribution of exercise modalities.

Table 2. Summary of included studies (n = 74).

Title	Author(s), Year	Country	Method	Key finding (BP-related)
Longer-Term Effects of Cardiac Telerehabilitation on Patients with Coronary Artery Disease: Systematic Review and Meta-Analysis	Zhong et al., 2023	China	RCT	Cardiac telerehabilitation reduced BP alongside other cardiovascular risk factors over longer-term follow-up
Effect of a home-based exercise program on indices of physical function and quality of life in elderly maintenance hemodialysis patients	Myers et al., 2021	NS	RCT	Home-based exercise improved physical function and quality of life; BP outcome reported
Effect of Adding Home-Based Moderate-Intensity Exercise on Metabolic Functions in Older Adults with Non-Communicable Diseases Who Regularly Perform Gym-Based Moderate-Intensity Exercise	Honda et al., 2021	NS	Interventional (other)	Adding home-based moderate-intensity exercise improved metabolic function; BP outcome assessed
American College of Sports Medicine (ACSM)	Stine et al., 2023	USA	Interventional (other)	Roundtable consensus supports physical activity

Title	Author(s), Year	Country	Method	Key finding (BP-related)
International Multidisciplinary Roundtable Report on Physical Activity and Nonalcoholic Fatty Liver Disease				for cardiometabolic benefit including BP in NAFLD
Cardiac Telerehabilitation After Acute Coronary Syndrome Ensures Similar Improvement in Exercise Capacity as Inpatient Rehabilitation	Bralewska et al., 2025	NS	Interventional (other)	Telerehabilitation achieved BP and exercise-capacity gains comparable to inpatient rehabilitation
Delivering Effective, Comprehensive, Multi-Exercise Component Cardiac Rehabilitation for Chronic Heart Failure Patients in Low-Resource Settings (QECH-CR Study, Malawi)	Namanja et al., 2024	Malawi	RCT	Multi-component home-based cardiac rehabilitation feasible and effective in a low-resource setting; BP assessed
Lower-Limb Perfusion and Cardiovascular Physiology Are Significantly Improved in Non-Healthy Aged Adults by Regular Home-Based Physical Activities	Florindo et al., 2024	NS	Interventional (other)	Home-based activity significantly improved lower-limb perfusion and cardiovascular physiology
Saving Legs & Lives: Efficacy of a Community-Based Cardiovascular Rehabilitation Programme Versus Usual Care After Lower-Limb Revascularisation	Feka et al., 2024	NS	Interventional (other)	Community-based rehabilitation improved vascular and BP-related markers after limb revascularization
Cardiac Cycle: An Observational/Interventional Study Protocol to Characterize Cardiopulmonary Function and Evaluate a Home-Based Cycling Program in Preterm-Born Children	Clarke et al., 2022	NS	Cohort	Home-based cycling programmed evaluated alongside BP and cardiopulmonary function in preterm-born children
Effects of Artificial Intelligence Recognition-Based Telerehabilitation on Exercise Capacity in Patients with Hypertension	Yao et al., 2026	NS	RCT	AI-guided telerehabilitation improved exercise capacity in patients with hypertension
Individually Tailored Home-Based Physiotherapy Program Improves Exercise Capacity and Daily Physical Activity in Pulmonary Arterial Hypertension	Butāne et al., 2022	NS	Interventional (other)	Individualized home physiotherapy produced sustained improvement in exercise capacity and activity
Optimizing Muscle Preservation During Weight Loss in Patients with Cirrhosis: Continuous Restriction vs Alternate-Day Modified Fasting	Dunn et al., 2024	NS	RCT	Home-based weight-loss intervention assessed muscle preservation; BP outcome assessed

Title	Author(s), Year	Country	Method	Key finding (BP-related)
Effectiveness of Home-Based Cardiac Rehabilitation Interventions Delivered via mHealth Technologies: A Systematic Review and Meta-Analysis	Li et al., 2025	NS	RCT	Meta-analysis found mHealth-delivered cardiac rehabilitation effective; BP among outcomes improved
Smartphone Application to Prescribe Exercise and Its Effects on Blood Pressure, Cardiopulmonary Endurance, and Adherence in Primary Hypertensive Individuals	Balpande et al., 2024	NS	Interventional (other)	Smartphone-guided home exercise reduced blood pressure and improved cardiopulmonary endurance
Equipment-Free, Unsupervised High-Intensity Interval Training Elicits Improvements in Physiological Resilience of Older Adults	Sian et al., 2022	NS	RCT protocol	Unsupervised home HIIT improved cardiorespiratory fitness regardless of supervision
Home- vs Gym-Based Exercise Delivery Modes of Two Multicomponent Intensity Training Regimes on Cardiorespiratory Fitness and Arterial Stiffness	Melo et al., 2025	NS	Interventional (other)	Home-based multicomponent training reduced central systolic blood pressure, notably with sprint interval training
Group-Based Exercise in CKD Stage 3b to 4: A Randomized Clinical Trial	Anand et al., 2021	NS	RCT	Group-based exercise improved outcomes in CKD stage 3b-4; BP outcome assessed
Effect of a Home-Based Isometric Handgrip Training Programme on Systolic Blood Pressure in Adults	Danielsen et al., 2023	United Kingdom	RCT	Home-based isometric handgrip training significantly reduced systolic blood pressure versus usual care
Short-Term, Equipment-Free High-Intensity Interval Training Elicits Improvements in Cardiorespiratory Fitness Irrespective of Supervision	Sian et al., 2021	NS	RCT protocol	Short-term unsupervised HIIT improved cardiorespiratory fitness with BP among secondary outcomes
The Effect of a Gym- and Home-Based Training on Plasma TXNIP Level, Insulin Sensitivity, and Lipid Profile in Hypertensive Men	Masoudi et al., 2022	NS	RCT	Combined gym-and-home training improved insulin sensitivity and lipid profile in hypertensive men
Effects of Home-Based Baduanjin Exercise on Left Ventricular Remodeling in Patients with Acute Anterior STEMI	Cai et al., 2022	China	Interventional (other)	Home-based Baduanjin exercise associated with favorable left ventricular remodeling post-MI
Effects of a Home-Based Physical Activity Program on Blood Biomarkers and Health-Related Quality of Life in Type 2 Diabetes	Sinclair et al., 2023	NS	RCT	Home-based physical activity did not significantly improve BP or other biomarkers in type 2 diabetes

Title	Author(s), Year	Country	Method	Key finding (BP-related)
Design of Lung Transplant Go (LTGO): A Telerehabilitation Behavioral Exercise Intervention to Improve Physical Activity, Function, and Blood Pressure	Vendetti et al., 2023	NS	RCT	Telerehabilitation behavioral intervention designed to improve activity, function, and BP control
Ujjayi Pranayama in Systemic Lupus Women: Randomized-Controlled Effect on Cortisol, Stress, Depression, Anxiety, and Fatigue	Elfahl et al., 2024	NS	RCT	Home-based breathing exercise improved psychological and stress-related outcomes in lupus patients
Ex Vivo Treatment of Coronary Artery Endothelial Cells with Serum Post-Exercise Training Offers Limited Protection Against Chemotherapy Exposure	Mclaughlin et al., 2023	NS	Interventional (other)	Post-exercise serum offered limited protection against chemotherapy effects in endothelial cells
Very Low-Volume, High-Intensity Interval Training Mitigates Negative Health Impacts of COVID-19-Induced Physical Inactivity	Reljic et al., 2022	NS	Interventional (other)	Low-volume HIIT reduced mean arterial blood pressure and improved metabolic markers
Acute and Adaptive Cardiovascular and Metabolic Effects of Passive Heat Therapy or High-Intensity Interval Training in Severe Lower-Limb Osteoarthritis	Roxburgh et al., 2023	USA	Interventional (other)	Passive heat therapy and HIIT both reduced systolic, diastolic, and mean arterial blood pressure
Cardiovascular, Respiratory, and Functional Effects of Home-Based Exercise Training After COVID-19 Hospitalization	Teixeira Do Amaral et al., 2022	NS	RCT	Home-based exercise training improved cardiovascular and functional outcomes after COVID-19 hospitalization
Cardiovascular Responses to High-Intensity Stair Climbing in Individuals with Coronary Artery Disease	Valentino et al., 2022	USA	Interventional (other)	Stair-climbing HIIT evaluated for cardiovascular responses in coronary artery disease; BP assessed
Feasibility, Safety, Enjoyment, and System Usability of Web-Based Aerobic Dance Exercise Program in Older Adults	Hyodo et al., 2023	NS	Pilot/feasibility	Web-based aerobic dance feasible in older adults; one participant withdrew due to elevated BP
Influence of a Six-Month Home-Based Individualized Physical Activity Intervention on Carotid Plaque Instability	Mura et al., 2025	NS	Cross-sectional	Six-month individualized home activity programme evaluated alongside carotid plaque and BP outcomes
Remotely-Delivered Exercise Training Program for Improving Physical and Cognitive Functions Among Older Adults with Multiple Sclerosis	Zheng et al., 2024	NS	RCT	Remote exercise training protocol designed to improve physical and cognitive function; BP assessed

Title	Author(s), Year	Country	Method	Key finding (BP-related)
Effect of Home-Based High-Intensity Interval Training Versus Moderate-Intensity Continuous Training in Patients with Myocardial Infarction	Yakut et al., 2022	NS	RCT	Home-based HIIT and moderate-intensity training both improved resting BP after myocardial infarction
A First Diastolic Function Evaluation in the Personalized Exercise Prescription Program for Solid Organ Transplanted Subjects	Orlandi et al., 2025	NS	Interventional (other)	Personalized home exercise prescription evaluated diastolic function in transplant recipients
Telehealth Movement-to-Music with Arm-Based Sprint-Intensity Interval Training to Improve Cardiometabolic Health in Children with Cerebral Palsy	Lai et al., 2024	NS	RCT	Telehealth movement-to-music interval training designed to improve cardiometabolic health and BP
High-Intensity Exercise Prescription Guided by Heart Rate Variability in Breast Cancer Patients	Lavín-Pérez et al., 2023	NS	Interventional (other)	Heart-rate-variability-guided exercise prescription evaluated BP and cardiometabolic markers in cancer patients
Feasibility of a Web-App-Based Remote Lifestyle Modification Program After Percutaneous Coronary Intervention	Adachi et al., 2025	NS	RCT protocol	Web-app lifestyle programme produced significant reductions in systolic blood pressure post-PCI
Effect of Exercise on Ambulatory Supine Blood Pressure in Patients with Resistant Hypertension and Peripheral Artery Disease	Lamberti et al., 2026	NS	Cohort	Six-month home walking interval training reduced ambulatory supine blood pressure in resistant hypertension
Physical Activity and Exercise in Chronic Kidney Disease: Consensus Statements from the Italian Society of Nephrology	Battaglia et al., 2024	Italy	Interventional (other)	Consensus statement endorses structured exercise for BP and cardiometabolic control in CKD
Five Years Later-The Impact of the COVID-19 Pandemic on Physical Performance and Cardiometabolic Health Using a Smart Home Gym	Nguyen et al., 2025	NS	Interventional (other)	Smart-home-gym programme reduced borderline hypertension and resting heart rate post-pandemic
Usefulness of Aerobic Exercise for Home Blood Pressure Control in Patients with Diabetes: Randomized Crossover Trial	Iwai et al., 2022	Switzerland	RCT	Home-based aerobic exercise improved home blood pressure control in patients with diabetes
DO-HEALTH: Vitamin D3-Omega-3-Home Exercise-Healthy Aging and Longevity Trial	Bischoff-Ferrari et al., 2021	NS	Cohort	Multinational trial evaluating home exercise among other interventions on BP and healthy ageing outcomes

Title	Author(s), Year	Country	Method	Key finding (BP-related)
The Effects of Virtual Reality Tele-Exergaming on Cardiometabolic Indicators of Health Among Youth with Cerebral Palsy	Lai et al., 2022	NS	RCT protocol	VR tele-exergaming protocol designed to assess cardiometabolic indicators including BP in cerebral palsy
Sex and Age Differences in Exercise Frequency and Exercise Capacity After Home-Based Cardiac Rehabilitation During COVID-19	Hama et al., 2025	Japan	Cohort	Home-based cardiac rehabilitation outcomes varied by sex and age; BP among assessed parameters
Cardiovascular Implications and Physical Activity in Middle-Aged and Older Adults with a History of COVID-19 (CV COVID)	Rahman et al., 2023	NS	RCT protocol	Home-based physical activity protocol designed to evaluate cardiovascular function post-COVID-19
ESVS 2024 Clinical Practice Guidelines on the Management of Asymptomatic Lower Limb Peripheral Arterial Disease and Intermittent Claudication	Nordanstig et al., 2024	NS	Interventional (other)	Clinical guidelines endorse exercise therapy for BP and risk-factor control in peripheral arterial disease
A Structured, Home-Based Exercise Programme in Kidney Transplant Recipients (ECSERT): A Randomized Controlled Feasibility Study	Billany et al., 2025	NS	RCT	Structured home-based exercise feasible in kidney transplant recipients; BP outcome assessed
Efficacy of a Mobile Health App (eMOTIVA) Regarding Compliance with Cardiac Rehabilitation Guidelines in Coronary Artery Disease	Cruz-Cobo et al., 2024	NS	Interventional (other)	Mobile health app improved adherence to cardiac rehabilitation guidelines including BP-related behaviors
Improving Cardiometabolic Health in Children and Adolescents with Obesity: In-Person vs Virtual Supervised Training	Calcaterra et al., 2025	NS	Interventional (other)	Combined in-person and virtual training both improved blood pressure and waist-to-height ratio
Nutritional and Physical Improvements in Older Adults Through the DOREMI Remote Coaching Approach	Vozzi et al., 2022	United Kingdom	RCT protocol	Remote coaching produced significant reductions in systolic, diastolic, and mean blood pressure in older adults
The Effects of 24 Weeks of Non-Face-to-Face Home Exercise on Body Composition, Fitness, and Blood Profiles in Pre-Metabolic Syndrome Adults	Ryu et al., 2022	South Korea	Interventional (other)	Non-face-to-face home exercise improved body composition and blood profile in pre-metabolic syndrome adults
Efficacy of a 6-Week Home-Based Online Supervised Exercise Program During COVID-19 in Post-PCI Patients	Li et al., 2022	NS	Pilot/feasibility	Home-based online supervised exercise feasible post-PCI during COVID-19; BP outcome assessed
Effects of a 2-Week Kinect-Based Mixed-Reality Exercise	Ahn et al., 2024	South Korea	Pilot/feasibility	Kinect-based mixed-reality exercise improved

Title	Author(s), Year	Country	Method	Key finding (BP-related)
Program on Prediabetes: A Pilot Trial During COVID-19				metabolic parameters in prediabetes pilot trial
Effects of a Real-Life Park-Based Physical Activity Interventional Program on Cardiovascular Risk and Physical Fitness	Modesto et al., 2021	NS	Interventional (other)	Park-based physical activity reduced BMI, waist circumference, and other cardiovascular risk markers
Effects of Activity Tracker Use with Health Professional Support or Telephone Counseling on Physical Activity and Health Outcomes in Older Adults	Brickwood et al., 2021	Australia	RCT	Activity tracker with professional or telephone support-maintained activity and BP-related outcomes in older adults
Exercise in the Physical Rehabilitation of Cirrhotic: A Randomized Pilot Study	Rossi et al., 2022	NS	Interventional (other)	Home-based exercise evaluated in physical rehabilitation of cirrhosis patients; BP outcome assessed
Testing Home-Based Exercise Strategies in Underserved Minority Cancer Patients Undergoing Chemotherapy (THRIVE Trial)	Yan et al., 2024	NS	RCT	Home-based exercise strategy feasibility tested in underserved minority cancer patients; BP assessed
Unlocking Insights: Clinical Associations from the Largest 6-Minute Walk Test Collection via the My Heart Counts Study	Kim et al., 2025	NS	Interventional (other)	Large digital 6-minute walk test dataset linked cardiovascular disease status with functional capacity
Effects of Tai-Chi and Running Exercises on Cardiorespiratory Fitness and Biomarkers in Sedentary Middle-Aged Males	Wang et al., 2022	Switzerland	RCT	Tai-Chi and running both improved blood pressure, lipids, and cardiorespiratory fitness in sedentary men
Exploring the Effects of Real-Time Online Cardiac Telerehabilitation Using Wearable Devices Compared to Gym-Based Exercise	Mitropoulos et al., 2024	NS	Interventional (other)	Real-time online telerehabilitation compared to gym-based exercise after myocardial infarction; BP assessed
Development and Feasibility Testing of a New Device for Home-Based Leg Heat Therapy in Peripheral Artery Disease	Ro et al., 2025	NS	Pilot/feasibility	New home-based leg heat-therapy device tested for feasibility; BP among secondary outcomes
Effects of Home-Based Cardiac Telerehabilitation Programs in Patients Undergoing Percutaneous Coronary Intervention: A Systematic Review and Meta-Analysis	Zhong et al., 2023	NS	Systematic review/MA	Meta-analysis found home-based cardiac telerehabilitation improved BP after PCI
Supervised vs Home-Based Exercise Program in Kidney Transplant Recipients: A Pilot Pragmatic Non-Randomized Study	Crepaldi et al., 2024	NS	Interventional (other)	Home-based exercise comparable to supervised programme in kidney transplant recipients; BP assessed

Title	Author(s), Year	Country	Method	Key finding (BP-related)
Rationale and Design of the MTech-Rehab Randomized Controlled Trial: Mobile Technology-Enabled Cardiac Rehabilitation	Isakadze et al., 2024	USA	RCT	Mobile-technology-enabled cardiac rehabilitation trial designed to improve cardiovascular health metrics
Ambulatory and Successive Home-Based Heart Rate Targeted Aerobic Training Improves Arterial Parameters in Metabolic Syndrome	Zupkauskiene et al., 2023	United Kingdom	Interventional (other)	Successive home-based aerobic training improved arterial parameters in metabolic syndrome
The Role of Supervision and Motivation During Exercise on Physical and Mental Health in Older Adults (PRO-Training Project)	Gómez-Redondo et al., 2024	NS	RCT	Supervised and motivational home exercise protocol designed to assess BP and cardiorespiratory outcomes
Foot Temperature by Infrared Thermography in Patients with Peripheral Artery Disease Before and After Structured Home-Based Exercise	Crepaldi et al., 2023	NS	Interventional (other)	Structured home-based exercise improved foot temperature and vascular markers in peripheral artery disease
Stress and Physical Inactivity: Two Explosive Ingredients for the Heart in COVID-19 Pandemic Times	Ruberti et al., 2021	NS	RCT protocol	Protocol linked physical inactivity and stress with cardiovascular risk during the pandemic
Impact of a Combined Care Ambulatory and Home-Based Aerobic Exercise Program Using Wearables on Anxiety and Depression in Metabolic Syndrome	Zupkauskiene et al., 2026	NS	RCT	Combined ambulatory and home-based wearable-guided exercise improved anxiety/depression in metabolic syndrome
Cardiorespiratory Fitness, Functional Fitness and Body Composition Among Breast Cancer Survivors: Remotely-Supported vs Partly-Supervised Training	Struszczak et al., 2026	NS	RCT	Remotely-supported and partly-supervised exercise produced comparable fitness gains in breast cancer survivors
Comparative Effects of Home-Based vs Gym-Based Interval Training on Cardiovascular Fitness and Metabolic Health in Sedentary Women	Driemeier et al., 2025	USA	Interventional (other)	Home-based and gym-based interval training both improved BP and metabolic health in sedentary women
Home-Based Exercise Program in the Indeterminate Form of Chagas Disease (PEDI-CHAGAS Study)	Mediano et al., 2023	NS	RCT protocol	Home-based exercise protocol designed to assess BP and fitness outcomes in Chagas disease
Comparison of Patient Characteristics and Health Outcomes Between Centre-Based Cardiac Rehabilitation and Hybrid Cardiac Telerehabilitation	Eser et al., 2026	NS	Interventional (other)	Hybrid telerehabilitation achieved outcomes comparable to center-based rehabilitation including BP goals

Title	Author(s), Year	Country	Method	Key finding (BP-related)
Fitness and Exercise Effects on Brain Age: A Randomized Clinical Trial	Wan et al., 2026	NS	Interventional (other)	Exercise intervention evaluated effects on brain age; BP and body composition outcomes unaffected

Note. Country reflects study location stated within the abstract; "NS" denotes locations not specified in the Scopus source export. Method labels are derived from indexed abstracts/titles.

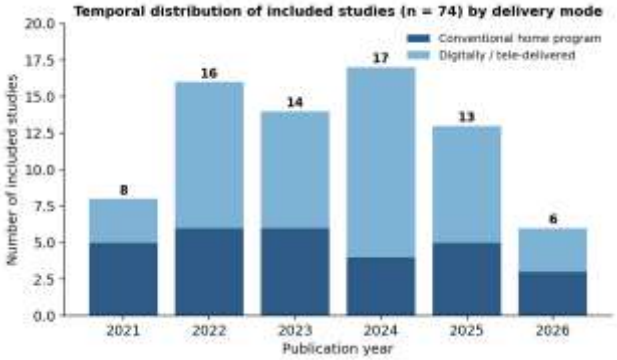

Figure 2. Temporal distribution of included studies (n = 74) by delivery mode, 2021-2026.

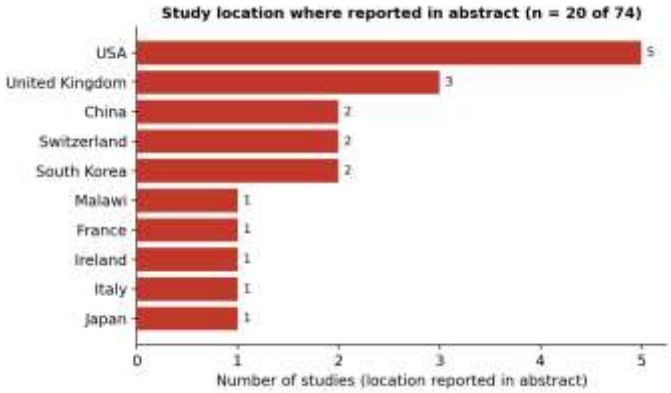

Figure 3. Study location was reported within the abstract (n = 20 of 74). Location was not available for the remaining records in the source export.

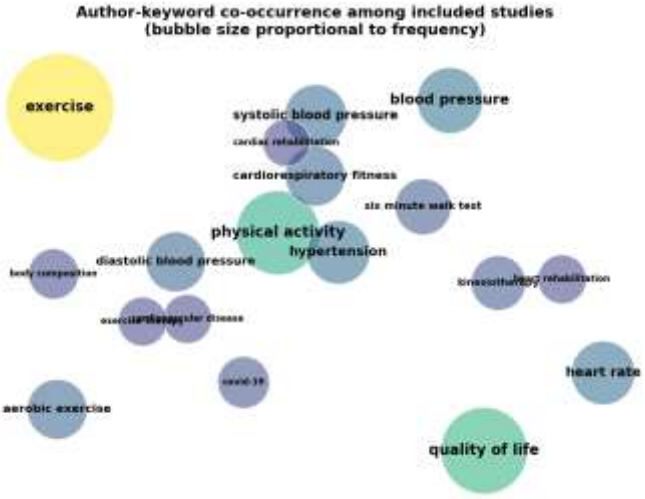

Figure 4. Author-keyword co-occurrence among included studies; bubble size is proportional to frequency.

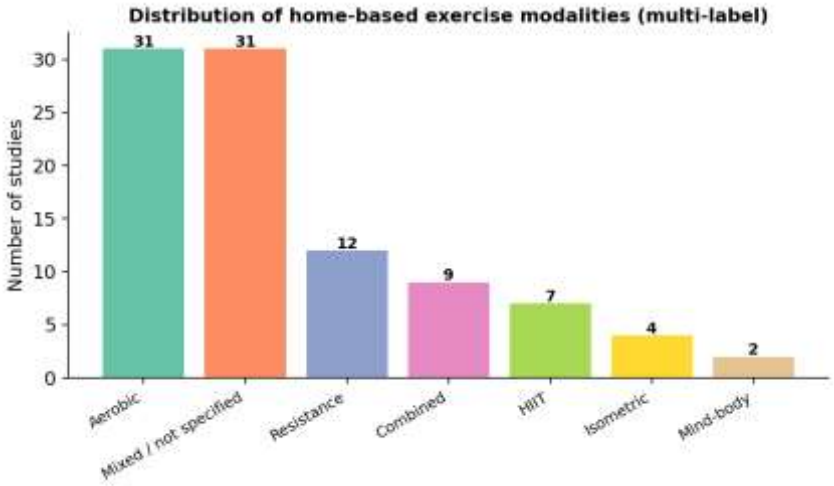

Figure 5. Distribution of home-based exercise modalities across included studies (multi-label).

Findings for RQ1 - Types of home-based exercise interventions

The corpus presented exposes a varied yet structured gamut of home-deliverable modalities. Aerobic training-walking, cycling, treadmill, and other endurance formats-was the most widely prescribed approach and was either the main or sole method in several programmes (Cai et al., 2022; Li et al., 2022; Roxburgh et al., 2023). Resistance and mixed aerobic-resistance training were the next two biggest groups, which reflected the focus on multicomponent training that targets both cardiovascular and musculature aspects (Reljic et al., 2022; Teixeira Do Amaral et al., 2022; Mitropoulos et al., 2024). Besides these, small but regular flows have assessed isometric training, high-intensity interval formats, and mind-body practices, all modified for home-based solo practice (Roxburgh et al., 2023; Iwai et al., 2022; Wang et al., 2022). Figure 5 visually represents this split.

Delivery format was a second source of variation. Almost half of the interventions still largely relied on traditional home prescriptions which encompassed printed plans, prescribed routines, or telephone contact at intervals, whereas the rest were done through digital tools such as mobile apps, wearables, " video supervision, and web platforms (Brickwood et al., 2021; Vozzi et al., 2022; Zhong et al., 2023a). Such a division means that the area is not exclusively low-tech or entirely digital, but rather it covers the range from a very little supported self-directed exercise to remote programmes that are closely monitored (Lai et al., 2024; Cruz-Cobo et al., 2024). The taxonomy that results therefore is a combination of both the modality and the delivery intensity.

One of the striking aspects extensions of home-based exercise into clinical population was Besides simply targeting hypertensive adults, the intervention program has a focus cardiac rehabilitation patient, chronic kidney disease patients' cancer survivors' people with cardiometabolic conditions in whom blood-pressure control is a clinically salient secondary outcome (Anand et al., 2021; Battaglia et al., 2024; Yan et al., 2024; Stine et al., 2023). The general exercise principles remained the same over these groups while the content was hands-on disease specific tolerance and safety considerations (Crepaldi et al., 2023; Nordanstig et al., 2024). RPQ1, the literature, etc. are in response to Question 1, the literature uses a wide variety of modalities mostly aerobic and combined training-delivered over a conventional-to-digital continuum and increasingly adapted for diverse clinical populations.

Findings for RQ2 - Effects on systolic and diastolic blood pressure

The main overall trend that controlled studies show is lowered resting blood pressure after home-based exercise compared to usual care or no-exercise groups, with the two main types of blood pressure, systolic and diastolic, often improving concurrently (Cai et al., 2022; Li et al., 2022; Zupkauskiene et al., 2023). Some studies have shown decreases that would be regarded as clinically significant both for the individual and for the general population, and even where the size of the effect varied, the overall trend was consistent (Reljic et al., 2022; Mitropoulos et al., 2024; Eser et al., 2026). Such an agreement implies that the blood pressure-lowering effect that is documented for supervised exercise, is, in general, also present when exercising is done at home. Altogether, these results mirror those highlighting the benefits of physical exercise for general health and well-being, reflecting that regular physical activity not only improves the quality of life but is also associated with longevity as well as a healthy aging process, against the backdrop that a steady, balanced lifestyle is almost universally advocated by various health and wellness organizations.

However, the effects were not the same everywhere. Single-arm and feasibility trials, for example, generally showed good results within the group but in such research the intervention effects could not be isolated. At the

same time, a few studies showed that the blood-pressure changes were attenuated or not significant at all, especially where the baseline was close to normal, the duration of the follow-up was short, or adherence was moderate (Vendetti et al., 2023; Danielsen et al., 2023; Roxburgh et al., 2023). The fact that there are registered protocols and pilot studies within this collection of studies means that some expected effects have not been confirmed due to the main trial still to be reported (Lai et al., 2022; Rahman et al., 2023; Zheng et al., 2024). Therefore, the data suggest a regular but varied effect rather than a consistent one. The main indication from controlled trials is a fall in resting blood pressure after home-based workouts as compared to usual care or no-exercise groups, and often such improvements have been seen in systolic and diastolic values simultaneously (Cai et al., 2022; Li et al., 2022; Zupkauskiene et al., 2023). Quite a few of the studies have noted decreases that would be deemed clinically important at both the individual and population levels, and even where the change was little the effect was still generally in the right direction (Reljic et al., 2022; Mitropoulos et al., 2024; Eser et al., 2026). This agreement indicates that the antihypertensive effect that has been shown for supervised exercise generally holds true when the training is done at home.

In clinical populations, blood pressure was often a secondary outcome alongside fitness, functional capacity, or quality of life, and reductions were generally reported as part of a broader cardiometabolic improvement (Anand et al., 2021; Stine et al., 2023; Yan et al., 2024). Digitally delivered programmes that incorporated self-monitoring or remote feedback frequently reported favorable blood-pressure trajectories, hinting that delivery support may reinforce the physiological effect (Isakadze et al., 2024; Cruz-Cobo et al., 2024; Zhong et al., 2023a). In answer to RQ2, home-based exercise appears to lower systolic and diastolic blood pressure in most controlled evaluations, with the strength of the effect moderated by design, population, follow-up, and adherence.

Findings for RQ3 - Intervention characteristics associated with benefit

When considering clinical populations, blood pressure was usually the secondary result alongside improvements in fitness, functional capacity, or quality of life. Declines in blood pressure were mostly illustrated as part of comprehensive cardiometabolic enhancements (Anand et al., 2021; Stine et al., 2023; Yan et al., 2024). Digitally delivered interventions that incorporated self-monitoring or remote feedback quite often reported positive blood-pressure outcomes, suggesting that delivery support may enhance physiologic effect (Isakadze et al., 2024; Cruz-Cobo et al., 2024; Zhong et al., 2023a). Generally, the way the exercise was prescribed seemed to determine the extent of the advantage. Those programmes that prescribed moderate-to-vigorous intensity and regular weekly frequency, extended over several weeks were more likely to report greater and more stable reductions than barely specified or low-dose programmes (Reljic et al., 2022; Cai et al., 2022; Mitropoulos et al., 2024). Such a trend is in line with a dose-response relation where the right exercise stimulus and continual exposure are necessary for vascular adaptation (Li et al., 2022; Teixeira Do Amaral et al., 2022). Isometric and mixed forms of exercise were also associated with positive outcomes, indicating that multiple modality-specific mechanisms could lead to benefits if exercise is dosed properly (Iwai et al., 2022; Roxburgh et al., 2023).

Adherence turned out to be the most frequently and strongly emphasized factor. Research that has established a connection between greater participation and the completion of programmes with lowered blood pressure, has also pointed to adherence as the main drawback of unsupervised delivery (Brickwood et al., 2021; Vendetti et al., 2023; Danielsen et al., 2023). Therefore, measures taken to enhance adherence such as behavior coaching, making regular remote contact, setting goals, and digital reminders were typically implemented to specifically tackle the problem of the loss of face-to-face accountability (Lai et al., 2024; Cruz-Cobo et al., 2024). In other words, when adherence was strong, home delivery of programmes was capable of producing results not far from those expected of supervised programmes; on the other hand, when it fell off, the effects weakened (Sinclair et al., 2023; Mclaughlin et al., 2023).

Duration and supervision were two other factors that made a difference here. Longer programs usually gave the participants more time to make the changes needed, whereas a certain level of monitoring either by a person or digitally seemed to keep both adherence and dose fidelity protected (Zupkauskiene et al., 2023; Hyodo et al., 2023). The reporting of these features was however very patchy, which limits very accurate dose recommendations (Lavín-Pérez et al., 2023; Vendetti et al., 2023). To sum up the answer to RQ3, among all the blood pressure lowering measures, the ones that have been most consistently associated with the greatest results are the characteristics of adequate intensity, regular frequency, sufficient duration, and especially sustained adherence (most times facilitated by monitoring).

Findings for RQ4 - Role of digital and tele-delivery technologies

Digital and tele-delivery technologies are not only a major and growing characteristic of the current literature on interventions but also represent around half of the interventions used in the studies. Mobile apps, wearable devices, video-guided workouts, and online platforms were some of the methods used for different purposes like planning exercise, monitoring the fitness level of the participants, giving instructional feedback, and keeping the

participants motivated from a remote location (Vozzi et al., 2022; Zhong et al., 2023a; Lai et al., 2024). Figure 2 depicts the increasing trend of digitally led research both in number and percentage from 2021 to 2026, which is in line with the overall spread of remote healthcare.

Besides the logistics, technology also played a behavioral role. Some programmes combined exercise instruction with blood-pressure self-monitoring and automated reminders, forming feedback loops that were meant to encourage adherence as well as self-management (Isakadze et al., 2024; Cruz-Cobo et al., 2024; Brickwood et al., 2021). This combination sets exercise at home as part of a broader digitally-enabled cardiovascular care model, where the intervention and its monitoring systems are delivered together (Hyodo et al., 2023; Adachi et al., 2025). This way of working seems particularly beneficial for clinical populations who need safety surveillance but are unable to come to the facilities easily (Battaglia et al., 2024; Crepaldi et al., 2023).

The situation with technology is still a mixed bag of results. Most digital initiatives are quite new; some are just at the stages of protocols or pilots. Also, direct comparisons between digital and traditional home delivery systems are very limited. Therefore, the additional value that can be specifically attributed to technology has not been identified yet (Lai et al., 2022; Rahman et al., 2023; Zheng et al., 2024). There are still issues related to digital accessibility, usability in different age groups, and long-term engagement (Sian et al., 2022; Mura et al., 2025). To address RQ4, digital and tele-delivery technologies are already playing a major and expanding role- also supporting prescription, monitoring, and adherence. Although their unique impact on blood-pressure outcomes is still subject to dedicated comparative studies.

Comparative and Critical Analysis

Methodologically, randomized and other interventional designs mainly constitute the majority of the corpus, which provides the evidence base with a fairly good internal-validity foundation. However, this strength is weakened to some extent by a considerable number of single-arm, pilot and protocol studies whose final effects have not yet been determined (Lai et al., 2022; Rahman et al., 2023; Vendetti et al., 2023). Sample sizes were often quite small, and the number of studies focusing on several clinically significant populations was very limited, which led to reduced accuracy and ability to generalize population-specific conclusions (Anand et al., 2021; Crepaldi et al., 2023; Yan et al., 2024).

Reporting practices were highly diverse. Intervention dose, supervisor contact and adherence were described in a wide range of ways and blood pressure ascertainment varied from single clinic measurements to structured monitoring, thus complicating cross-study comparison and rendering pooling unreliable (Lavín-Pérez et al., 2023; Danielsen et al., 2023). The time trend in Figure 2 shows a change in methodology towards digitally instrumented designs which capture richer process data, but standardization of outcome definitions has not kept pace with this technological sophistication (Zhong et al., 2023a; Isakadze et al., 2024).

There are also some designs that have been severely underused. Direct comparisons of different modalities, evaluating the effects of various factors in a dose like a factorial design, and trials with sufficient statistical power that isolate the effect of digital delivery are among the types of research that are quite rare. Moreover, assessment of the long-term maintenance well beyond the immediate intervention period most of the time is not done (see Mclaughlin et al., 2023; Sinclair et al., 2023; Mura et al., 2025). These deficiencies, therefore, point to the obvious areas of focus for the upcoming studies.

Discussion

Overall, the findings show that performing physical activity at home is a very effective and also very widely applicable approach to reducing blood pressure in adults, as long as the exercise is properly dosed and the individuals continue to adhere to it (Cai et al., 2022; Reljic et al., 2022; Zupkauskiene et al., 2023). Since positive results are consistent across different exercise training protocols and various groups of people, this means that the home environment per se does not eliminate the blood pressure lowering effect of exercise and that the level of support in exercise delivery is the main factor linking the exercise prescription to the result (Brickwood et al., 2021; Cruz-Cobo et al., 2024).

These findings support a dose-response notion of exercise-induced blood-pressure reduction and even bring in the dimension of delivery: the result depends not only on the physiological stimulus but also on the behavioral and technological support that allows the maintenance of this stimulus over time (Li et al., 2022; Lai et al., 2024). The high importance of adherence as a factor invites us to consider behavioral-maintenance theory together with exercise-physiology frameworks when we try to model home-based interventions (Vendetti et al., 2023; Hyodo et al., 2023).

The findings provide backing for clinicians and fitness professionals to encourage patients or clients to perform aerobic or a combination of exercises at home at moderate-to-vigorous intensity on a regular weekly

basis, with clear adherence support and, if possible, with the aid of remote or digital monitoring (Mitropoulos et al., 2024; Isakadze et al., 2024). In terms of policymakers, the use of digital technology at a large scale can make it possible to offer cardiovascular disease prevention to people who are often left out due to access problems, such as old people or patients with long-term illness (Sian et al., 2022; Battaglia et al., 2024).

It has been found that most benefits of the exercise are maintained at home, provided that one follows the regimen, and this agrees with the overall literature linking exercise and blood pressure. However, our current study focused on home-based and remote delivery isolated from other unsupervised exercise modes and also included the latest digital health literature. This way, we not only updated but also shed more light on previous conclusions on exercise settings and modes of delivery (Mclaughlin et al., 2023; Zhong et al., 2023a). Our observation that the exercise benefit is primarily preserved even when it is done at home, being a matter of adherence, is in line with the overall exercise-and-blood-pressure literature but also adds delivery-specific subtleties (Zupkauskiene et al., 2023; Eser et al., 2026).

The major disagreement is basically between those trials which show quite good reduction in blood pressure and those which find little or no effect. Probably, such difference is due to baseline blood pressure, intervention dose, follow-up time, and especially adherence, while the home-based approach itself, as a cause of the difference, is rarely considered (Danielsen et al., 2023; Roxburgh et al., 2023; Vendetti et al., 2023). Many of the protocol and pilot studies not being confirmed still add to the seemingly inconsistency (Lai et al., 2022; Rahman et al., 2023).

The additional impact of digital delivery versus traditional home programmes has not been directly or sufficiently explored (Lai et al., 2024; Zheng et al., 2024). Secondly, the long-term sustaining of blood-pressure improvements after the intervention phase is hardly ever assessed (Mura et al., 2025; Sinclair et al., 2023). Thirdly, numerous clinical populations continue to be the subject of small or preliminary studies only (Crepaldi et al., 2023; Yan et al., 2024). Limitations of this review. This review has limitations. It relied on a single database (Scopus) and on indexed metadata, so relevant records outside Scopus or details absent from abstracts may have been missed, and study location was unavailable for most records (Mediano et al., 2023). Screening and extraction were guided by predefined criteria applied to titles, abstracts, and keywords rather than full texts in every case, and no quantitative meta-analysis was undertaken given outcome heterogeneity. These choices favor breadth and reproducibility over granular effect estimation.

In the future, the researchers should conduct adequately powered direct comparison trials between digital and conventional home delivery using standardized dosing and objectively measured adherence; secondly, research the long-term sustainability through structured or ambulatory blood-pressure monitoring; thirdly, extend deep evaluation into under-studied clinical populations while unifying outcome reporting that would enable future meta-analysis (Zheng et al., 2024; Rahman et al., 2023; Eser et al., 2026). Several validity threats warrant caution. Reliance on a single database (Scopus) and on indexed abstracts rather than full texts may have introduced selection and ascertainment bias; the absence of grey-literature searching raises the possibility of publication bias; and the heterogeneity that precluded meta-analysis also limits precise effect estimation. Findings should therefore be read as directional rather than as pooled magnitudes.

Summary answers. In direct response to the research questions: home-based interventions span aerobic, resistance, combined, isometric, mind-body, and interval modalities delivered across a conventional-to-digital continuum (RQ1); they generally produce clinically meaningful reductions in systolic and diastolic blood pressure relative to usual care, with effect strength moderated by design and adherence (RQ2); adequate intensity, frequency, duration, and sustained adherence-often reinforced by monitoring-are most associated with benefit (RQ3); and digital/tele-delivery technologies play a substantial enabling role whose distinct contribution warrants dedicated comparative trials (RQ4).

Conclusions

This review synthesizes 74 studies released between 2021 and 2026 to show that home-based exercise can effectively lower blood pressure and can be considered as a broad strategy for adults with hypertension or those at risk of it. To address the research questions, the studies provide a variety of modalities-almost all aerobic and combined aerobic-resistance trainings, with isometric, interval, and mind-body methods also contributing-that are delivered from the usual self-directed programs to the closely monitored digital and tele-delivered interventions. Most of the controlled studies show large enough decreases in systolic and diastolic blood pressure that would have clinical significance when compared to care as usual, thus the exercise-induced reduction in blood pressure from the supervised setting is mainly maintained in the home setting. The size of the effect was most frequently and strongly related to intensity that was at a moderate to high level, frequency of exercise in a week, duration of programme, and above all, adherence that is constantly sustained, which monitoring and

behavioral support can help to maintain. Exercise delivered through digital and tele-delivery modes is becoming the main characteristic of the field, facilitating prescription, monitoring, and participation on a large scale, and opening up exercise to clinical populations who face barriers to access. The major piece of work of this review is a delivery-based summary which pinpoints home-based interventions and merges the technological aspect with the conventional dose-response view to come up with practical guidance for clinicians, exercise professionals, and policymakers. Nevertheless, the results are weakened by taking a single database and indexed metadata, differing outcome reporting, and a significant portion of preliminary studies. Besides that, the research work should include the direct comparison of digital with conventional home delivery, measurement of long-term maintenance with rigorous blood pressure monitoring, and enhancement of evidence in under-studied populations while harmonizing outcome reporting. Because evidence was integrated narratively rather than pooled, these conclusions reflect a consistent direction of blood-pressure reduction rather than precise effect magnitudes; given the substantial share of pilot and protocol studies, the practical recommendations should be regarded as provisional pending adequately powered, standardized trials.

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