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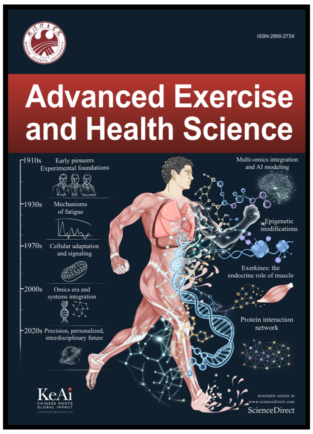
Tyagi, Naina, Malamouli, Melpomeni, Rodgers, Raymond J, McAinch, Andrew and Patten, Rhiannon (2026) Effectiveness of home-based high-intensity interval training on psychophysiological outcomes in adults: a systematic review. Advanced Exercise and Health Science. ISSN 2950-273X

Journal Pre-proof



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PII: S2950-273X(26)00045-7

DOI: https://doi.org/10.1016/j.aehs.2026.07.002

Reference: AEHS83

To appear in: *Advanced Exercise and Health Science*

Received date: 17 February 2026
Revised date: 12 June 2026
Accepted date: 10 July 2026

Effectiveness of home-based high-intensity interval training on psychophysiological outcomes in adults: a systematic review

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Abstract

High-intensity interval training (HIIT) is a time-efficient exercise modality known for improving cardiorespiratory fitness and various health outcomes. Home-based HIIT offers an accessible and flexible option for individuals facing barriers to traditional exercise environments. This systematic review evaluates the effectiveness of home-based HIIT in enhancing physiological outcomes, assessing its capacity to deliver benefits comparable to those of supervised settings. Primary outcomes included cardiorespiratory fitness ($\dot{V}O_{2peak}$, exercise capacity). Secondary outcomes included metabolic parameters (insulin sensitivity, lipid profile), body composition (body mass, BMI, fat mass, waist circumference), and mental health. Eight studies were included, comprising three randomised controlled trials and five non-randomised studies. Participant mean age ranged from approximately 23 to 52 years, and mean BMI ranged from 21 to 35 kg/m². Across studies that reported sex distribution, participants included both males and females, although sex reporting was incomplete in several studies. Home-based HIIT elicited significant improvements in $\dot{V}O_{2peak}$ across all studies, ranging from approximately 5% to 16%. Improvements in body composition were reported in four studies, including reductions in BMI and body fat percentage. Only one study assessed mental health related outcomes including SF-36 domains, psychological vitality, and affective state; however, depression, anxiety and stress outcomes remain underreported. Adherence was generally moderate-to-high across most studies, although reporting methods varied between interventions. Due to heterogeneity in participant populations, intervention protocols, supervision levels and outcome reporting, a narrative synthesis was undertaken. Current evidence suggests that home-based HIIT may improve cardiorespiratory fitness; however, further well-designed trials are required to examine long-term adherence, safety, and sustainability.

Keywords

High-intensity interval training; Home-based exercise; Adherence; Cardiorespiratory fitness; Body composition

1. Introduction

Sedentary behaviour and a lack of physical activity have become increasingly prevalent in recent decades, leading to detrimental effects on overall health.[1] A modern lifestyle, characterised by prolonged periods of sitting, minimal physical exertion, and an increased reliance on technology, has contributed to a significant rise in sedentary behaviours.[2] This shift has profound public health implications,[3-5] contributing to an increased prevalence of metabolic syndrome and cardiometabolic risk factors, including hypertension, central adiposity, dyslipidaemia and insulin resistance; ultimately elevating the risk for cardiovascular disease.[6-8] Recent research also highlights a significant connection between physical inactivity and increased levels of anxiety, depression, and psychological distress.[9] Moreover, physical inactivity can exacerbate feelings of low self-esteem and poor body image, further impacting mental well-being.[10]

According to the World Health Organisation (WHO), adults should engage in at least 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity physical activity per week.[11] However, many fail to meet these recommendations.[12] As such, finding time-efficient and effective forms of exercise is critical for improving population health. One such approach, high-intensity interval training (HIIT), has gained recognition as a highly effective method for enhancing overall health and well-being.[13-15] HIIT requires exercise to be performed at ≥ 85% of peak oxygen consumption ($\dot{V}O_{2peak}$), or ≥ 90% of maximum heart rate (HR_{max}) or ≥ 85% of heart rate reserve and involves short bursts of intense exercise followed by periods of rest or low-intensity exercise, making it a potent and time-efficient form of physical activity.[16]

HIIT offers numerous health benefits, notably increased cardiorespiratory fitness, a key indicator of overall health.[17] Moreover, HIIT has a positive impact on cardiometabolic health, improving blood lipid profiles, glucose metabolism, and insulin sensitivity.[18-21] Besides physical benefits, HIIT has also shown improvements in mental health outcomes, decreasing the symptoms of depression, anxiety, and psychological stress.[22] This positive impact on HIIT is further enhanced by the engaging nature of the workouts, which tend to be perceived as more enjoyable and motivating [23] than traditional moderate-intensity continuous training (MICT).[24] Moreover, the structured format of HIIT sessions makes them feel shorter and more manageable, while also providing individuals with a sense of satisfaction and accomplishment.[25]

Although HIIT has demonstrated significant improvements in the overall health of adults, most existing studies have been conducted in laboratories or supervised environments, which have some limitations. For those in remote areas, access to fitness facilities can be a challenge, whilst for others, the cost of gym memberships or fitness trainers can be prohibitive,[26] complicating efforts to maintain physical and mental well-being.[27]

This lack of access worsens health disparities.[28] Participating in HIIT at home offers a potential solution. Home-based HIIT eliminates the need for gym access, providing an affordable and convenient option for individuals facing time constraints, family responsibilities, or limited access to fitness facilities.[29, 30] By eliminating the need for gym fees and reducing travel expenses, individuals can participate in a more affordable workout regimen, while also increasing adherence. Home-based HIIT can be delivered using different exercise modalities, including bodyweight exercises or stationary cycling.[29, 31-33] Bodyweight-based HIIT is particularly relevant in-home based settings because it requires minimal equipment, space, and financial cost,[33, 34] with exercises such as squats, lunges, burpees, jumping jacks and running-on-the-spot allowing participants to reach high exercise intensities without specialised equipment.[34-36] However, stationary cycle-based HIIT may also be suitable for some individuals, as cycle ergometers are commonly used to assess and prescribe high-intensity exercise in controlled studies.[37-40] Several studies and meta-analysis have demonstrated the benefits of HIIT for improving cardiovascular and metabolic health; most have been conducted under laboratory or supervised conditions.[41-44] Consequently, it remains unclear whether home-based HIIT is a feasible and effective approach to enhance health outcomes outside of highly controlled laboratory settings. Therefore, this systematic review aims to evaluate the effects of home-based HIIT on physiological and mental-health-related outcomes in adults, while also examining adherence, safety, retention and feasibility of home-based HIIT interventions.

2. Methods

2.1. Search strategy

This review was registered at PROSPERO (CRD42023458939). A comprehensive systematic search was initially conducted up to 26 August 2024 across the following electronic databases: EBSCOhost (including PsycINFO, MEDLINE, SPORTDiscus, and CINAHL), PubMed, EMBASE, and Web of Science. The search was subsequently updated on 12th of May 2026 to identify recently published eligible studies. The search was restricted to peer-reviewed, published articles in English. A combination of Medical Subject Headings (MeSH) and relevant keywords related to HIIT, and home-based interventions was used. The search terms are reported in Supplementary Table 1.

The reference lists of relevant review articles were manually screened to identify additional potentially eligible studies. Following the removal of duplicates, two reviewers (NT and RKP) independently screened all titles and abstracts for relevance. Full-text articles deemed potentially eligible were then assessed separately by the same reviewers. Any discrepancies during the screening process were resolved through discussion or, when necessary, in consultation with a third reviewer (AJM). For studies meeting the inclusion criteria, data were independently extracted by NT and RKP using a pre-specified data extraction form.

2.2. Eligibility criteria

Studies were eligible for inclusion if they were published in English and involved adult participants aged between 18 and 65 years (Table 1). Eligible studies evaluated a home-based HIIT intervention of at least two weeks in duration, delivered in either a supervised or unsupervised format. Interventions were required to include HIIT protocols performed at an intensity of ≥ 85% of $\dot{V}O_{2peak}$ or ≥ 90% of HR_{max}.[16] Exercise modalities could include aerobic training, resistance training, or a combination of both. To meet inclusion criteria, studies were required to report on at least one of the following primary outcomes: cardiorespiratory fitness assessed via $\dot{V}O_{2peak}$; anthropometric outcomes such as body mass index (BMI), body fat percentage, or waist and hip circumference; metabolic parameters including insulin and lipid profile measures; or mental health outcomes.

Exclusion criteria included studies involving participants with a diagnosis of cancer, individuals undergoing or having recently completed cardiac rehabilitation, patients with existing cardiovascular diseases, neurological conditions, or any other medical conditions that could impair their ability to safely perform HIIT.

Table 1. Eligibility criteria for study inclusion.

Participants	Intervention	Outcome	Eligible study designs	Limits
Adults aged 18-65 years	HIIT protocols ≥ 85% of $\dot{V}O_{2peak}$ or ≥ 90% of HR_{max}) - Greater than 2 weeks in duration	Cardiorespiratory fitness ($\dot{V}O_{2peak}$) Metabolic- measures of insulin sensitivity and lipid profile Body composition- body weight, BMI, fat mass, W/H ratio Mental health- depression, anxiety, and stress	Randomised and non-randomised intervention studies evaluating home-based HIIT	English language Human trials Peer-reviewed

BMI: body mass index; HIIT: high-intensity interval training; HR_{max}: maximum heart rate; RCT: randomised controlled trial; $\dot{V}O_{2peak}$: peak oxygen consumption; W/H ratio: waist to hip ratio.

2.3. Outcomes

The primary outcomes assessed included cardiorespiratory fitness ($\dot{V}O_{2peak}$); metabolic parameters (blood levels of total cholesterol, high-density lipoprotein, low-density lipoprotein, triglycerides, fasting glucose, and insulin, and homeostatic model assessment of insulin resistance); body composition (body weight, body mass index, fat mass expressed as percentage or in kilograms, and waist/hip circumference ratio); and mental health outcomes.

2.4. Risk of bias

Risk of bias was independently assessed by two reviewers (NT and MM) using the Cochrane Risk of Bias tool (RoB2) for randomised controlled trials and the Risk of Bias in Non-randomised Studies of Interventions (ROBINS-I) tool for non-randomised studies. Any discrepancies in judgment were first discussed between the two reviewers. If consensus could not be reached, a third author (RKP) was consulted to resolve the disagreement.

2.5 Data synthesis

Due to substantial heterogeneity across the included studies, a meta-analysis was not conducted. Although $\dot{V}O_{2peak}$ or aerobic capacity was reported across all included studies, the studies differed considerably in participant characteristics, intervention duration and HIIT protocol. Some studies reported absolute changes in $\dot{V}O_{2peak}$, whereas others reported percentage change, post-intervention values or broader aerobic capacity outcomes. In addition, comparator conditions varied across studies, including no-intervention controls, moderate-intensity continuous training, laboratory-based HIIT, personal trainer-guided exercise and self-monitoring approaches. These methodological and clinical differences limited the suitability of statistical pooling. Therefore, findings were synthesised narratively according to outcome domain, direction of effect, adherence, supervision level, intervention delivery and study quality.

3. Results

The search identified 4,800 records; after removing 2,571 duplicates, 2,229 records were screened for eligibility (Figure 1). Titles and abstracts were screened for relevance, resulting in the exclusion of 2,174 records that did not meet the inclusion criteria. Subsequently, 55 full-text articles were assessed for eligibility, of which 47 were excluded for reasons including wrong setting (n = 1), outcomes (n = 4), intensity (n = 7), intervention (n = 21), study design (n = 2), missing intensity reporting (n = 2), wrong patient population (n = 9), or article not found (n = 1). A total of eight studies were included in the qualitative synthesis, three were randomised controlled trials (RCTs)[32, 34, 45] and five non- randomised or partly randomised intervention studies.[30, 31, 46-48] The characteristics of the included studies are detailed in Table 2. Across the included studies, participant sex distribution was mixed, limiting precise pooled reporting of male/female ratios.

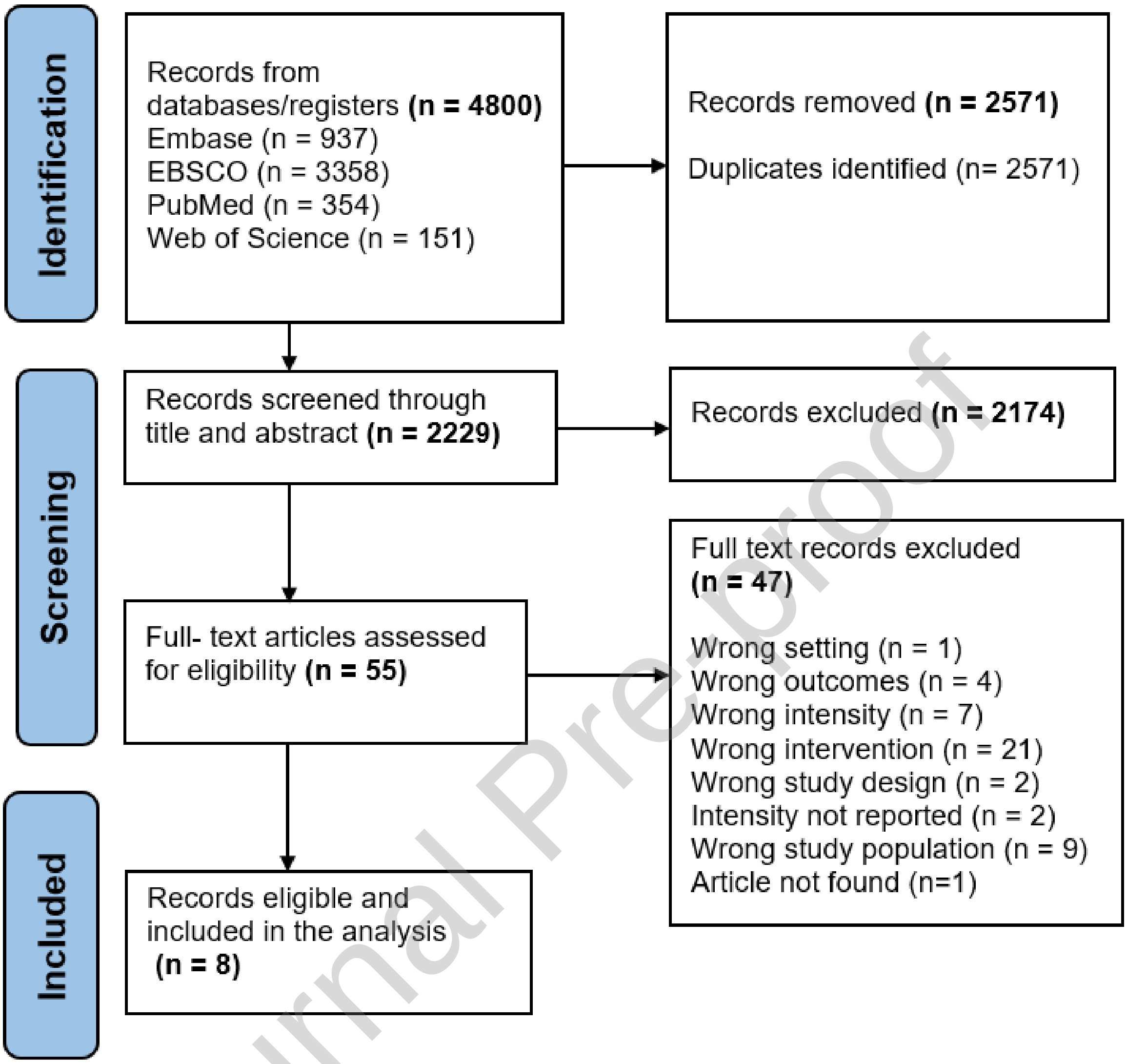

Figure 1. Preferred reporting items for systematic reviews and meta-analyses (PRISMA) study selection flow diagram.

Table 2. Summary of studies identified for systematic review detailing participants, intervention characteristics and main outcome measures.

Study	Publication year	Participant characteristics	Home-HIIT N (M/F)	Home-HIIT intervention	Interval details	Cardiorespiratory outcomes	Cardiometabolic health outcomes	Adherence rate	Dropout rate

Blackwell et al.,[32]	2017	Middle-aged sedentary Age: 52 ± 5 BMI: 27 ± 3	6 (NR)	Frequency: 3 sessions/week Duration: 4 weeks	Body weight aerobic intervals 5 × 1 min intervals with a 90s recovery	↑ $\dot{V}O_{2peak}$	No significant change	100% adherence rate	NR
Casanova-Lizón et al.,[48]	2025	Sedentary adults Age: 40.5 ± 9.3 (AUG); 37.4 ± 12.5 (PTG) BMI: 25.7 ± 3.9 (AUG); 25.2 ± 4.4 (PTG)	AUG: 18 (8/10) PTG: 23 (6/17)	Frequency: 3 sessions/week Duration: 11 weeks	30s exercise with 30s recovery, progressing to 40s exercise with 20s recovery	↑ $\dot{V}O_{2peak}$ ↑ upper and lower body strength ↑ HRV	NR	AUG: 70.6% PTG: 74.2%	AUG: 9/31 PTG: 5/29
Hesketh et al.,[31]	2021	Adults categorised as at-risk. Age: 49 ± 10 BMI: 30 ± 6	86 (47/39)	Frequency: 3 sessions/week Duration: 12 weeks	Body weight aerobic intervals 4-9 × 1 min intervals with 1 min recovery	↑ $\dot{V}O_{2peak}$	↓ BMI ↓ Body mass	39% self-reported adherence	NR

Kraushaar & Krämer,[46]	2014	Sedentary and overweight healthy adults Age: 51 ± 9 BMI: 29 ± 3	60 (NR)	Frequency: 3 sessions/ week Duration: 24 weeks	Aerobic intervals 4 × 1 min intervals with 4 min recovery	$\uparrow \dot{V}O_{2peak}$	$\downarrow$ BMI $\downarrow$ Body weight $\downarrow$ Body fat	72% adherence among active participants	NR
Scott et al.,[30]	2019	Adults with Type 1 diabetes mellitus Age: 30 ± 3 BMI: 27 ± 1	11 (4/7)	Frequency: 3 sessions /week Duration: 6 weeks	Progressive body weight aerobic intervals 6-10 × 1 min intervals with 1 min recovery	$\uparrow \dot{V}O_{2peak}$	$\downarrow$ Daily short-acting insulin	95% adherence	NR
Scott et al.,[47]	2019	Sedentary, obese Age: 32 ± 8 BMI: 35 ± 4	9 (NR)	Frequency: 3 sessions/week Duration: 12 weeks	Progressive body weight aerobic intervals 4-8 × 1 min intervals with 1 min recovery	$\uparrow \dot{V}O_{2peak}$	$\downarrow$ BMI $\downarrow$ Body fat % $\downarrow$ Body mass $\downarrow$ Visceral fat mass $\downarrow$ Insulin AUC	96% adherence	NR
Scoubeau	2023	Healthy adults	14 (NR)	Frequency: 3 sessio	Whole-body	$\uparrow \dot{V}O_{2peak}$	No significa	98% adherence	3 participants

et al.,[45]		Age: 23 ± 1 BMI: 21 ± 3		ns/week Duration: 8 weeks	aerobic intervals 4 × 30-sec intervals with 30s recovery		nt change		from WB-HIIT discontinued early.
Sian et al.,[34]	2021	Healthy adults Age: 27 ± 4 BMI: 26 ± 4	10 (5/5)	Frequency: 3 sessions/week Duration: 4 weeks	Body weight aerobic intervals 5 × 1 min intervals with 90s recovery	↑ $\dot{V}O_{2peak}$	↓ BMI	100% adherence after excluding one participant who did not meet minimum session requirements.	1/10 in the H-HIIT group did not complete the required number of sessions.

Age and BMI are presented as mean ± standard deviation. Age is reported in years and BMI as kg/m². AUC: area under the curve; AUG: autonomous group BMI: body mass index; H-HIIT: home-based high-intensity interval training; HIIT: high-intensity interval training; HRmax: maximum heart rate; HRV: heart rate variability; M/F: male/female; NR: not reported; PTG: personal trainer-guided group; $\dot{V}O_{2peak}$: peak oxygen uptake; WB-HIIT: whole-body high-intensity interval training; W/H ratio: waist-to-hip ratio; ↑ indicates a significant increase; ↓ indicates a significant decrease.

3.1. Risk of bias assessment

The risk of bias assessment included both RCTs and non-RCTs. These were evaluated using the Cochrane RoB 2 tool and the ROBINS-I tool, respectively. Among the RCTs, two studies,[32, 34] were judged to have some concerns overall, due to minor issues in the randomisation process and the selection of reported results. One RCT study[45] was rated as high risk overall, primarily due to serious concerns in Domain 2 (deviations from intended interventions) (Figure 2).

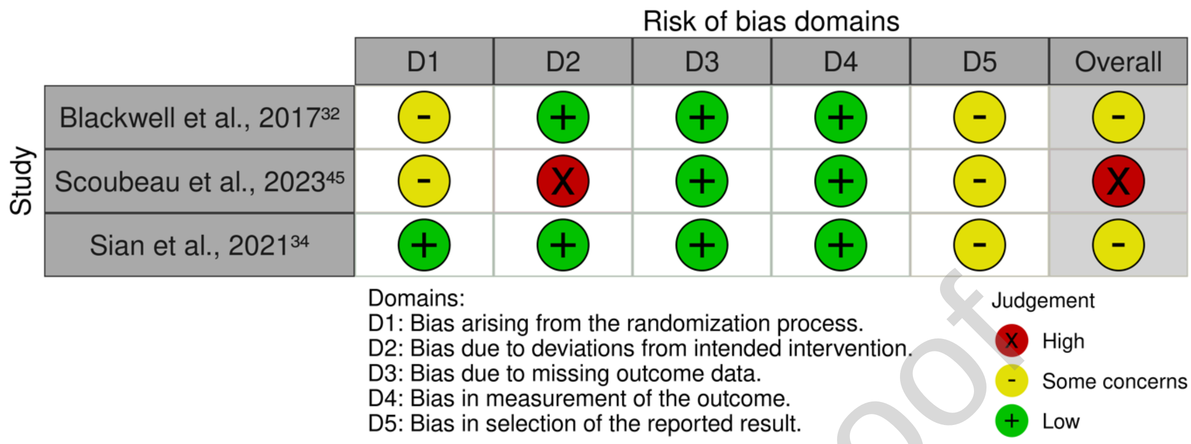

Figure 2. Risk of bias for randomised controlled trials (ROB 2).

In contrast, all included non-RCTs were judged to have serious or critical risk of bias (Figure 3). One study [46] was rated as critical across most domains, particularly in terms of confounding, participant selection, intervention classification, missing data, and selective reporting. Furthermore, two studies [30, 31] demonstrated a critical overall risk due to unresolved confounding and serious reporting concerns. Two studies[47, 48] were rated as having a serious overall risk; despite low and moderate risk across several domains, concerns remained regarding confounding and missing data. While outcome measurement (Domain 6) was generally rated as low to moderate risk across the studies, the persistent issues in confounding control, missing data handling, and reporting led to a serious or critical overall risk in the non-randomised studies.

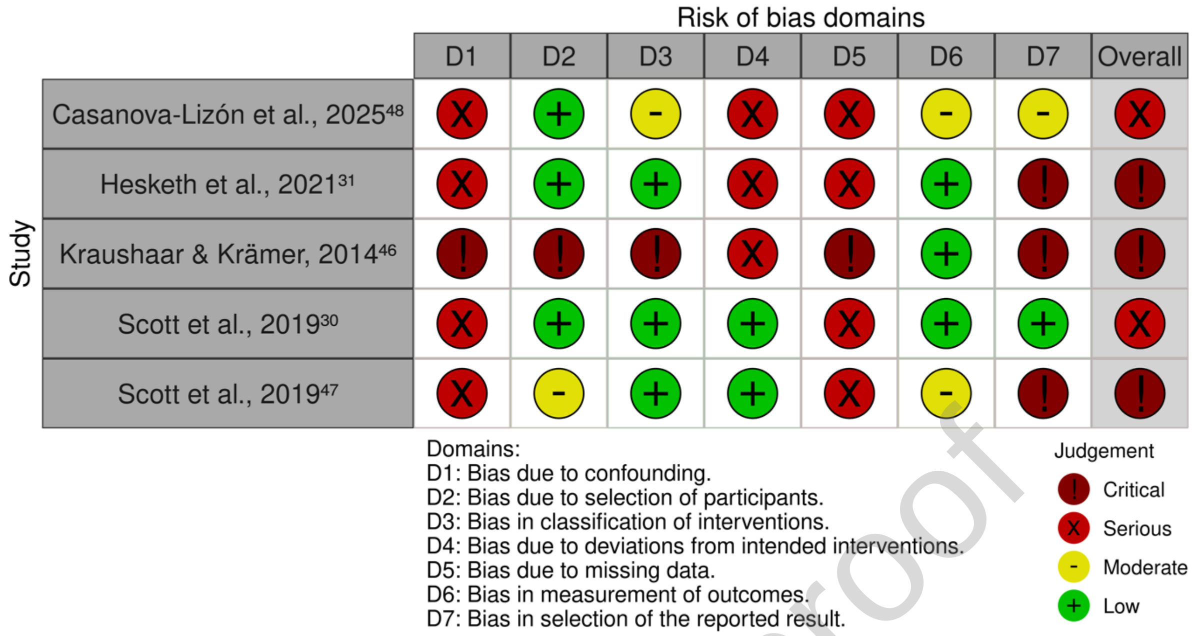

Figure 3. Risk of bias in non-randomised studies (ROBINS-I).

3.2 Cardiorespiratory fitness

All eight studies reported statistically significant increases in $\dot{V}O_{2peak}$ following a home-HIIT intervention ranging from 2.0 to 6.0 mL·kg^{-1}·min^{-1} (approximately 5% to 16%). One study reported a 2.7 ± 4.4 mL·kg^{-1}·min^{-1} increase post-intervention, which was maintained at three-month follow-up (2.0 ± 5.7 mL ·kg^{-1}·min^{-1}).[31] Another study observed a rise of 5.9 ± 4.8 mL ·kg^{-1}·min^{-1}.[45] After four weeks of HIIT study, participants reported a gain of +2.55 mL·kg^{-1}·min^{-1} .[34] When reported as a percentage, one study observed a +16% increase following 12 weeks of virtually supervised home-HIIT. [47] Crucially, improvements appear to be sustainable; one study reported an initial increase of 2.8 ± 4.5 mL·kg^{-1}·min^{-1}, which was maintained at a three-month follow-up.[31] Similarly, another 24-week web-enabled feedback intervention reported a mean increase in $\dot{V}O_{2peak}$ of 3.73 mL ·kg^{-1}·min^{-1}.[46] In a heart-rate variability (HRV) guided app-based study, $\dot{V}O_{2peak}$ increased by 1.62 mL·kg^{-1}·min^{-1} in the autonomous group (AUG) and 2.81 mL·kg^{-1}·min^{-1} in the personal trainer-guided group

(PTG) following the 11-week intervention.[48] This study also reported significant improvements in heart rate variability, in both intervention groups.[48] Across studies, improvements appeared most consistent when interventions included structured exercise prescription, feedback, heart-rate monitoring, virtual support, or progressive intensity prescription. In contrast, the magnitude of improvement varied between studies, likely reflecting differences in participant baseline fitness, intervention duration, intensity prescription, supervision level and adherence.

3.3 Body composition

Six of the eight studies assessed body composition, with four reporting reductions in body weight, BMI, and fat mass. Specifically, participants who adhered to a 24-week web-enabled HIIT program demonstrated significant reductions in BMI from 29.9 ± 3.5 to 28.3 ± 1.5 kg/m^2 and body fat from 27.5 ± 8.4 to 23.9 ± 3.7 kg.[46] Similarly, another study reported significant reductions in BMI.[34] Another study showed a decrease in both body mass and BMI after just four weeks of training, and these improvements were maintained through the full 12-week period.[47] There was also a significant decrease in body fat percentage (4%) and visceral fat mass (−27%). [47] In contrast, one study reported no significant changes in body composition. [45]

3.4 Metabolic parameters

Only two out of eight studies measured metabolic markers, of which one study reported a decrease in daily insulin dose of 13% in individuals with type 1 diabetes following 6 weeks of home-based HIIT.[30] Another study reported a 24% decline in insulin area under the curve (AUC) among sedentary individuals with obesity following a 12-week intervention.[47]

3.5 Mental health

Mental-health-related outcomes were underrepresented across the included studies. One study assessed health-related quality of life using the SF-36, as well as psychological vitality and affective state.[48] In that study, the personal trainer-guided group showed significant improvements in several SF-36 domains, including vitality and mental health, while the autonomous group showed improvement in health evolution. Both intervention groups also improved psychological vitality and affective state compared with the control group.

3.6 Adherence and drop-out rates

Adherence was reported in all eight included studies, although reporting methods varied. High adherence was observed in several interventions, where two studies reported 100% adherence[32, 34] for their four-week intervention period (after excluding one participant who failed to meet minimum session requirements). While another study observed a 98% completion rate.[45] Similarly, two studies [30] and [47] achieved high adherence rates of 95% and 96%, respectively. A web-based self-monitoring program reported 72% adherence among active participants.[46] In contrast, adherence dropped substantially in a trial lacking feedback or supervision, where self-reported participation averaged only 39%.[31] In the heart-rate variability (HRV) guided app-based study,[48] participants in the autonomous group completed 23.3 of 33 planned sessions, corresponding to approximately 70.6% adherence, while the personal trainer-guided group completed 24.5 of 33 sessions, corresponding to approximately 74.2% adherence. Dropout reporting was inconsistent across studies. Where reported, dropout rates ranged from 10% in one short-term home-HIIT group[34] to 29.0% in the autonomous HRV-guided group.[48] No serious intervention-related adverse events were reported across the included studies.

4. Discussion

This systematic review evaluated the effects of home-based HIIT on physiological outcomes, with additional consideration of adherence, safety and mental-health-related outcomes where reported, across eight studies.[30-32, 34, 45-48] The included studies encompassed diverse adult populations, ranging from individuals with type 1 diabetes to adults who were overweight and sedentary and healthy individuals. Across these studies, consistent improvements in cardiorespiratory fitness were observed, indicating that home-based HIIT is an effective intervention for enhancing aerobic capacity and eliciting favourable aerobic adaptations. This is an important outcome, as higher fitness levels are strongly linked to better cardiovascular and metabolic health;[49] with small improvements, reducing the risk of chronic disease and premature death.[50] Across the included studies, the most consistent finding was improvement in cardiorespiratory fitness. However, the magnitude of improvement varied between studies and may be explained by differences in baseline fitness, intervention duration, intensity prescription, supervision level and adherence. Studies that included structured prescription, heart-rate monitoring, virtual supervision, or feedback appeared to report more consistent adherence and training completion, suggesting that support and monitoring may be important for successful home-based HIIT delivery.[30, 31, 34, 46-48, 51]

The novelty of this review is in synthesising evidence specific to home-based HIIT delivery. Although the included home-based HIIT studies consistently reported improvements in $\dot{V}O_{2peak}$, this review cannot confirm that the physiological adaptation pathways are identical to laboratory based HIIT. Laboratory HIIT studies have shown that HIIT can improve mitochondrial capacity, skeletal muscle oxidative markers, endothelial function, capillarisation, and $\dot{V}O_{2peak}$. For example, Little et al. showed increased skeletal muscle mitochondrial capacity after low-volume laboratory HIIT,[52] while Cocks et al. reported increased skeletal muscle microvascular density and eNOS content after supervised interval training.[53] However, only one included home-based HIIT study assessed mechanistic outcomes. Scott et al. reported improvements in skeletal muscle capillarisation and the eNOS/NAD(P)H oxidase protein ratio following virtually supervised home-HIIT.[47] Therefore, improvements in $\dot{V}O_{2peak}$ should be interpreted as evidence of improved functional aerobic capacity, not direct proof that home-based HIIT produces the same central or peripheral adaptations as laboratory HIIT. Some included studies did directly compare home-based and laboratory HIIT. Blackwell et al. reported that both unsupervised home-HIIT and supervised laboratory-HIIT improved cardiorespiratory fitness.[32] Sian et al. similarly found that supervised laboratory bodyweight HIIT and unsupervised home-HIIT improved $\dot{V}O_{2peak}$

irrespective of supervision status.[34] The strongest mechanistic evidence came from Scott et al., who compared virtually supervised Home-HIT with laboratory HIT and found similar improvements in muscle capillarisation and the eNOS/NAD(P)H oxidase protein ratio.[47]

While cardiorespiratory fitness improved consistently, findings for body composition were more variable. The variability in body composition findings may reflect differences in intervention duration, adherence, baseline metabolic status and unmeasured lifestyle factors such as diet. None of the included studies formally monitored or controlled participants' nutritional intake, limiting the interpretation of the observed changes.[57] Interventions of longer duration or those involving groups of individuals at metabolic risk, such as Kraushaar and Krämer's[46] 24-week web-enabled program, showed notable reductions in body mass, fat percentage, and BMI, alongside enhanced aerobic capacity.[46]

In contrast, short-term studies, such as those by Sian et al.[34] and Scott et al.[30] reported minimal body compositional changes despite significant improvements in $\dot{V}O_{2peak}$. A primary reason for this discrepancy may be that substantial fat loss requires a sustained negative energy balance, which is influenced by compensatory dietary intake.[58] Furthermore, HIIT can concurrently increase lean muscle mass, which can mask fat loss when only measuring total body weight or BMI.[59, 60] Therefore, while HIIT is a powerful tool for improving cardiorespiratory function, its role in weight and fat reduction is more complex and may depend heavily on concurrent dietary habits, intervention duration, and individual physiological responses.

Few studies included detailed metabolic profiling, which limited conclusions regarding lipid or glycaemic modulation. Nonetheless, Scott et al.[30] observed a 13% reduction in daily insulin dose without adverse glycaemic excursions in individuals with type I diabetes, suggesting improved insulin sensitivity.[30] The broader literature corroborates this, indicating that HIIT enhances insulin sensitivity, mitochondrial function, and endothelial health, even in the absence of concurrent weight loss.[61-64] Such findings underscore the importance of incorporating comprehensive biomarker panels in future trials.

The findings of this review are broadly consistent with recent meta-analytic evidence showing that HIIT can improve cardiometabolic health and body composition outcomes across different populations.[55, 65] Recent reviews have reported favourable effects of HIIT on cardiorespiratory fitness, glycaemic control, blood pressure and adiposity-related outcomes, although effects on body composition are often smaller and more dependent on diet, intervention duration and baseline health status.[41, 55, 65, 66] Importantly, Tsuji et al.[67] reported that home-based HIIT improved cardiorespiratory fitness compared with non-exercise controls and found no significant difference between home-based and laboratory based HIIT for cardiorespiratory fitness.[67]

Mental-health-related outcomes remain an evidence gap in home-based HIIT research. Although one included study assessed SF-36 domains, psychological vitality and affective state,[48] no included study directly assessed depression, anxiety or stress as primary clinical outcomes. Therefore, the current evidence does not allow firm conclusions regarding the effects of home-based HIIT on mental health. Future studies should include validated psychological measures alongside physiological outcomes to determine whether home-based HIIT provides broader health benefits.

While the physiological adaptations demonstrate the capacity of home-based HIIT to enhance metabolic health, their real-world efficacy ultimately depends on participants' ability to engage and adhere to prescribed intensities consistently. Adherence has been repeatedly identified as a critical determinant of both the magnitude and sustainability of training-induced benefits.[55, 68] Across the included studies, adherence rates varied substantially, reflecting the influence of supervision level, feedback mechanisms, and participant motivation. Interventions that incorporated virtual monitoring and real-time feedback achieved the highest compliance. For example, Scott et al.[30] reported 95% adherence using live heart rate monitoring and virtual supervision, while Kraushaar and Krämer [46] documented 72% adherence among participants who adopted a web-based self-monitoring system. In contrast, Hesketh et al.[31] observed only 39% adherence in an unsupervised program where participants self-selected HIIT sessions, underscoring the importance of structured oversight and feedback for sustaining participation. These findings align with broader evidence indicating that technology-enabled feedback and behavioural reinforcement are key facilitators of adherence in remote exercise interventions.[69, 70]

Digital tools, such as wearables, app-based tracking, and tele-supervision, not only enhance accountability but also address well-documented barriers to exercise, including time constraints, travel demands, and a lack of access to facilities.[71, 72] Future research should also examine how personalised feedback systems, adaptive progression algorithms, and hybrid supervision models (combining digital and human support) influence adherence and exercise fidelity. Such approaches could optimise the translation of home-based HIIT into sustainable public health strategies, particularly for individuals with limited access to traditional exercise facilities or supervision.

Despite encouraging findings, several limitations constrain definitive interpretation. Sample sizes were modest, and long-term follow-up beyond 12 weeks was rare. Reporting of adherence, adverse events, and retention was inconsistent, and metabolic and psychological outcomes were underrepresented. Dropout and retention should also be considered when interpreting adherence. Several studies reported adherence among participants who completed the intervention but did not clearly report dropout rates.[30, 32, 46, 47] Where dropout was reported, retention varied substantially between studies. This distinction is important because high adherence among completers may overestimate real-world feasibility if a considerable proportion of participants did not start or did not complete the intervention. The strength of the conclusions is also limited by the methodological quality of the included studies. Several non-randomised or partly randomised studies were judged to have serious or critical risk of bias,[30, 31, 46-48] mainly due to confounding, participant selection, missing data, and selective reporting. Among the randomised studies, risk of bias concerns also remained,[32, 34, 45] particularly in relation to deviations from intended interventions and selection of reported results. Therefore, although the consistency of improvements in cardiorespiratory fitness is encouraging, findings for body composition, metabolic outcomes, and long-term adherence should be interpreted cautiously. Future home-based HIIT studies should report recruitment, uptake, adherence, compliance, dropout, reasons for withdrawal and adverse events separately to support more accurate interpretation of feasibility and implementation potential. Future research should therefore prioritise larger, standardised trials that incorporate longitudinal follow-up to assess the sustainability of health improvements. Inclusion of comprehensive cardiometabolic and psychological measures will be vital to capture the multidimensional impact of home-based HIIT. Moreover, leveraging wearable technology, tele-supervision, and adaptive feedback algorithms could enhance personalisation, adherence, and compliance.

5. Conclusions

Collectively, the available evidence demonstrates that home-based HIIT effectively improves cardiorespiratory fitness across diverse populations, with additional, though variable, benefits for body composition and metabolic health. Adherence is highest when virtual monitoring or feedback mechanisms are integrated, confirming the value of technology-supported delivery. However, the certainty of the evidence is limited by heterogeneity in study design, intervention delivery and outcome reporting, as well as high, serious, or critical risk of bias in several studies. Future well-designed trials should directly compare home-based and supervised HIIT, include mechanistic and psychological outcomes, and evaluate long-term adherence, retention, safety and sustainability.

Funding

This work did not receive any specific grant from funding agencies in the public, commercial or not-for-profit sectors.

CRediT author statement

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Raymond J Rodgers: Writing – Reviewing and editing. Andrew J McAinch: Conceptualisation, Study screening, Supervision, Writing – Reviewing and editing. Rhiannon K Patten: Conceptualisation, Methodology, Supervision, Conflict resolution (risk of bias), Writing – Reviewing and editing.

Acknowledgements

All individuals who contributed substantially to the conception, development, and preparation of this manuscript have been acknowledged as authors.

Declaration of competing interests

Andrew J. McAinch serves as Editor-in-Chief, and Rhiannon K Patten serves as an editorial board member of Advanced Exercise and Health Science. Neither was involved in the editorial peer review or the decision-making process for this manuscript. All remaining authors declare that no conflict of interest could be perceived as prejudicing the impartiality of this review.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.