

Impact of Kettlebell Exercises on Cardiovascular Health among Healthy Individuals :

A Scoping Review in Healthy Individuals

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Abstract—The combination of strength and aerobic conditioning is seen in kettlebell exercises, which is a good form of resistance training. The aim of this scoping review is to assess its impact on the physical fitness and cardiovascular health of healthy individuals. Six of the approximately 1,540 articles, as per the literature search conducted using PubMed, Google Scholar, and ResearchGate, fulfilled the inclusion criteria for the study. The study results revealed improvements in body composition, strength, and endurance, as well as cardiovascular parameters, with improvements in VO₂max, heart rates, and heart rate variability, similar to other conventional training techniques such as bodyweight, cycling, and barbell exercises. Thus, it may be concluded that although more research is needed, kettlebell exercises are safe and effective for improving musculoskeletal cardiovascular health among healthy individuals.

Keywords: Kettlebell training, Cardiovascular health, Resistance training ,VO₂max

1.Introduction

A concerted effort between the heart, blood vessels, and blood to provide adequate circulation and oxygenation is termed cardiovascular health." The morbidity, mortality, and quality of life in a population are all affected by optimal cardiovascular health, which is a key component in the establishment of physiological equilibrium in the body. A series of diseases is initiated by disruptions in this process, such as myocardial stress or endothelial dysfunction.^(1,2)

With a projected figure of 19.2 million deaths in the year 2023, a substantial rise from the 13.1 million in 1990, cardiovascular diseases are the main cause of death in the world today. Due to factors such as urbanization, metabolic factors like diabetes and obesity, and population aging, the burden of cardiovascular diseases has escalated to 626 million cases worldwide. In the year 2023, there were 437 million disability-adjusted life years (DALYs) attributed to cardiovascular diseases, signifying the growing socioeconomic burden in both high and low-income regions.^(1,2)

Exercise has been identified as an essential component of preventive measures that incorporate the prevention of the progression of CVD through the mitigation of risk factors. According to the World Health Organization, 150 to 300 minutes of moderate-intensity aerobic physical activity should be performed every week to prevent the onset of CVD, which aligns with the importance of regular physical activity. These strategies reduce the costs of CVD management in an economical fashion by strengthening the vascular resilience and metabolic efficiency before the onset of the disease.Regular physical activity has been identified as having a dose-response relationship in the prevention of CVD, where the risk of CVD is reduced by 22 to 46% in individuals who adhere to the regimen as identified by the meta-analytic studies. The effectiveness of the prevention of CVD is also enhanced by the incorporation of cardiac rehabilitation that has been identified to reduce the risk of reinfarction by 47% in patients after myocardial infarction.^(2,3,4)

Kettlebell training, which originated as 'girya' for military and agricultural training in 18th-century Russia, employs a cannonball-shaped weight with a handle for dynamic, ballistic movements. The evolution of kettlebell training, initially as counterweights on markets, into a sport with increasing popularity worldwide, facilitated by the strength training of the Soviets and modern fitness training, gathered momentum during the 20th century. This form of training requires the implementation of strength, power, and endurance simultaneously in a unique manner.⁽⁵⁾

Any exercise performed with kettlebells involves a hybrid physiological stress response, which includes aerobic components that increase oxygen consumption to 65% VO₂max, as well as resistance components for muscular power production. Kettlebell exercises utilize multiple energy systems, which distinguishes them from other training modalities that focus on only one energy system at a time." This dual nature of kettlebells makes it easy for them to be used for improving fitness levels.^(7,8,9)

The snatch, which involves the entire body, is a ballistic movement performed overhead, the clean and press, which involves the pull, catch, and stabilization of the weight overhead, and the kettlebell swing, which involves the explosive movement of the hips to throw the weight backwards, are examples of core exercises. These exercises involve the strengthening of the stabilizers of the core, as well as the posterior chain, while emphasizing dominance of the posterior chain. The metabolic rate is maintained at high levels with exercises such as 15:15 intervals, which involve 15 seconds of work followed by 15 seconds of rest.^(10,11,12)

Kettlebell training is different from aerobic training, which involves steady-state cardio, as it involves high-force eccentrics and anaerobic training, as well as traditional resistance training, which involves the use of momentum and movement in multiple planes of motion, as opposed to concentric movements only. This makes kettlebell training much more challenging for the metabolic system, as well as for the posterior chain.^(13,8,7)

As per the American College of Sports Medicine standards, kettlebell exercises conducted over a short period of time exhibit high cardiovascular responses, with heart rates averaging 87 to 93% of maximum heart rates and 65% peak VO₂. Cardiac output increases with high blood flow and a surge in sympathetic tone, accompanied by an increase in blood lactate levels proportional to glycolytic activity. Systolic and diastolic blood pressures fall dramatically after 10 to 30 minutes of recovery, indicating a state of post-exercise hypotension.^(9,11,14)

The phosphagen and glycolytic energy systems are maximally challenged by kettlebell exercises, which gradually become oxidative dominant, as indicated by 65 to 87% VO₂max. With 8 to 12 weeks of kettlebell training, 70% increases in core strength and 13.8% increases in VO₂max, accompanied by decreased heart rates, are indicative of enhanced cardiac efficiency and parasympathetic tone.^(15,8,17)

Kettlebell exercise has been found to be equally effective in increasing VO₂ max as MICT and uses less time to have similar hypotensive effects. Unlike HIIT, kettlebell exercise offers additional benefits in resistance exercise with similar peak heart rate responses. The meta-analysis has supported the hybrid application of kettlebell exercise in healthy cohorts with slight advantages for HIIT in left ventricular function.^(16,17,18)

By increasing cardiovascular reserves before the onset of risks, kettlebell exercise offers preventive cardiology in healthy cohorts. It reduces future CVD risks starting from a baseline of excellent health by improving fitness components like VO₂ max and dynamic balance. This ensures peak ability in the presence of increasing risks due to lifestyle factors, which is in line with primordial prevention.^(8,7,4)

Despite promising data on both acute and chronic effects, individualized preventative prescriptions are limited by a lack of synthesis evidence on cardiovascular effects of kettlebell exercises in healthy individuals. In an effort to identify gaps and trends in the literature that will guide future research, this scoping review attempts to systematically map existing literature on cardiovascular effects of kettlebell exercises on cardiovascular health outcomes such as heart rate, VO₂max, blood pressure, and adaptations.

2. Methodology :

Information Sources :

A scoping review was conducted to explore the impact of kettlebell exercises on cardiovascular health in healthy individuals. A systematic literature search was performed using electronic databases such as PubMed, Google Scholar, and ResearchGate. Relevant studies were identified using keywords including “*kettlebell training*,” “*kettlebell exercise*,” “*cardiovascular health*,” “*physical fitness*,” “*resistance exercise*,” and “*functional strength*.” These keywords were combined using appropriate Boolean operators to retrieve relevant articles. The search initially yielded approximately 1,540 articles, which were screened based on their titles and abstracts.

Eligibility Criteria :

Studies were included if they were published in English within the last five years and investigated the effects of kettlebell exercise interventions on cardiovascular health outcomes in healthy individuals. Experimental and intervention-based study designs such as randomized controlled trials, quasi-experimental studies, pragmatic controlled trials, and pilot studies were considered. Studies involving participants with existing diseases, review articles, editorials, conference abstracts, and studies not focusing specifically on kettlebell exercises were excluded. After removing duplicates and conducting full-text screening based on the eligibility criteria, six studies were found to meet the inclusion criteria and were included in the final review. Relevant data from these studies, including study design, participant characteristics, kettlebell training protocols, and cardiovascular outcomes, were extracted and summarized narratively.

Criteria	Inclusion	Exclusion
Participants	<ul style="list-style-type: none"> • Age = 18–65 years • Healthy individuals, sedentary individuals, or physically inactive adults • Participants performing kettlebell exercise interventions 	<ul style="list-style-type: none"> • Age above 65 years • Individuals with severe cardiovascular, neurological, or systemic diseases • Animal studies
Type of Study	<ul style="list-style-type: none"> • Randomized Controlled Trials (RCTs) • Quasi-experimental studies • Controlled trials • Experimental studies • Pilot studies 	<ul style="list-style-type: none"> • Review articles • Study protocols • Editorials, commentaries, and conference abstracts

3.Results :

Six papers were included in the review after a total of about 1,540 articles were found and reviewed. These studies' results showed that kettlebell-based therapies were linked to increases in cardiovascular health, muscular strength, endurance, and general physical fitness. Positive effects on body composition and autonomic function were also noted in a number of trials. Kettlebell training showed results comparable to those of other exercise modalities such as bodyweight movements, cycling, and barbell training in comparative studies. Overall, information points to the safety, efficacy, and advantages of kettlebell movements for enhancing a number of fitness and health variables in a variety of demographics and training approaches.

Outcomes of Articles selected :

Sr. NO.	First Author	Year	Type of study	Outcome
1.	Alexei Wong	2021	Experimental Study	Blood pressure (BP) Heart rate (HR) Autonomic function
2.	Neil J. Meigh	2022	Pragmatic controlled trial	Grip strength Anthropometrics Cardiorespiratory endurance Muscular strength and power Muscular endurance Flexibility Body composition Functional capacity and balance Quality of life and sense of coherence Training load

3.	Xavier Melo	2023	Quasi-experimental Study	Oxygen uptake Blood lactate heartrate
4.	Karuppasamy Govindasamy	2024	RCT	Fitness variables VO2max (ml/kg/min) Push-Ups (numbers) Sit-Ups (numbers) Sit and Reach (centimeters) Physiological variables Vital Capacity (mL) Resting Heart Rate (bpm) Mean Arterial Blood Pressure (mmHg) Breath Holding Time (s) Respiratory Rate (numbers) Biochemical variables High Density Lipoprotein (HDL) (mg/dl) Low Density Lipoprotein (LDL) (mg/dl) Total cholesterol (mg/dl) Triglycerides (mg/dl)
5.	Aman Paisal	2025	pilot study	HRV anthropometric parameters
6.	Tuncay ÖKTEM	2025	Experimental study	anthropometric digital back leg dynamometer measurement vertical jump performance measurement maximal 1 repetition "squat" performance measurement maximal 1 repetition "deadlift" performance measurement.

Sr.no.	FIRST AUTHOR	INTERVENTION	CONCLUSION
1.	ALEXEI WONG	<ul style="list-style-type: none"> • Twelve minutes of two-hand Russian kettlebell swings with 30 seconds of activity and 30 seconds of rest were done by the participants. • 16 kg kettlebell was used for the men, and 8 kg kettlebell was used for the women participants. • In order to maintain the swings in the right manner, the swings were done in a regulated manner with the assistance of an investigator and the use of a metronome, with 15 swings in each round. • Because of the high cardiovascular and metabolic responses observed in the participants in the earlier studies, the protocol was chosen for the experiment. • In the control trial, the participants were made to rest in the supine position for the same 12 minutes. 	<p>The study concluded that findings indicate that KB exercise increases sympathovagal balance for 30 minutes post intervention, which is concurrent with an important hypotensive effect.</p>
2.	Neil J. Meigh	<ul style="list-style-type: none"> • For 12 weeks, the participants engaged in three 45-minute kettlebell group sessions every week, along with two home-based workout sessions. • Some of the basic kettlebell exercises that the participants learned in the first week included swings, squats, presses, cleans, and Turkish get ups. • Depending on the comfort levels, the training sessions began at low intensity, followed by moderate to high intensity. • A mobility warm-up, as well as a workout, was included in the sessions. Moreover, the training details were also recorded in logs. • Owing to the COVID-19 pandemic, the home training sessions were conducted online for the rest of the weeks, starting from the first six weeks of physical training sessions. • A 100 swings per day challenge was also included in the training sessions, which increased the training sessions to 15 weeks. 	<p>This study shows that for sedentary individuals aged 60 to 80, group-based hardstyle kettlebell training at moderate to high intensity was safe, interesting, and beneficial. Participants demonstrated good adherence, no significant adverse effects, and increases in grip strength, cardiovascular fitness, muscular strength, endurance, functional ability, and body composition over the course of three months of five-day-a-week training.</p>
3.	Xavier Melo	<ul style="list-style-type: none"> • The research, conducted for a span of 4 weeks among gymnasts, included two types of groups. • Three times a week, the REGULAR+KB group included exercises such as kettlebell swings ($\frac{1}{4}$ body weight) as part of their workout routine. • The workout routine included twelve cycles of 30-second intervals of swings and breaks of 30 seconds each. • Planks, handstands, rope jumps, pull-ups, and flips were some of the skills practiced regularly by the gymnasts. 	<p>When compared to normal training alone, adding kettlebell training to regular gymnastics practice did not significantly improve metabolic or cardiorespiratory responses.</p> <p>On the other hand, VO_2max rose in the kettlebell training group. During exercises, both training techniques lowered peak heart rate. Additionally, they slowed VO_2 recovery and reduced blood lactate levels, which may aid in</p>

		<ul style="list-style-type: none"> • Before the research, the participants followed a controlled diet and avoided alcohol, tobacco, and caffeine for a day. 	the recovery of energy (PCr) following exercise.
4.	Karuppasamy Govind asamy	<ul style="list-style-type: none"> • The exercise program adopted in the study was a 12-week program comprising three sessions of 60 minutes each, conducted three times a week. • The warm-up, main exercise, and cool-down phases were integral components of the exercise program. • Squats, push-ups, lunges, burpees, etc., were the exercises adopted for the bodyweight group at varying levels of intensity. • Turkish get-ups and overhead squats at 60-80% of 1-RM were the exercises adopted for the kettlebell group. • To enhance the strength, power, and functional fitness of the individuals, the programs were carefully designed, closely monitored, and progressed. 	<p>In obese people, kettlebell training and bodyweight resistance training both enhanced physical fitness, body composition, and a few physiological and biochemical markers.</p> <p>The results indicate that a regular workout regimen can successfully incorporate any training strategy.</p>
5.	Aman Paisal	<ul style="list-style-type: none"> • Turkish get-ups, squats, curls, overhead presses, and push-ups are all part of 20-minute kettlebell workouts, performed three to five sets of five to ten repetitions at a moderate intensity (60–80% 1-RM) with brief rest intervals. • Every four weeks, the program's level of difficulty progressively increased. Cycling group: cycled continuously for 20 minutes at a mild to moderate intensity. 	The study concluded that,, combining kettlebell and cycling exercise can improve cardiovascular health and overall physical fitness in 64 healthy individuals, increasing HR by 55% but decreasing LF and HF power
6.	Tuncay ÖKTEM	<ul style="list-style-type: none"> • A 10-week training program with three sessions each week was included in the study. • Kettle bells and bar bells were utilized for the training of the two groups. Warm-up, exercise, and cool-down were included in each 70-minute session. • Seven resistance exercises that focused on the main muscle groups were the focus of the training sessions. The only difference between the two programs was the equipment utilized. 	The study concluded that, it can be said that fitness and kettlebell training are effective training types on the change of physical parameters of sedentary individuals.

4. Discussion

In this scoping review, the existing body of evidence on the impact of kettlebell exercises on cardiovascular health and fitness in healthy individuals was explored. The study revealed that kettlebell exercises are capable of improving cardiovascular parameters, such as autonomic balance, blood pressure management, and heart rate response, among other fitness parameters. The study on acute effects of kettlebell swings, for instance, revealed that there is a significant improvement in sympathovagal balance and a transient hypotensive response following the exercises, implying that kettlebell swings might be beneficial in cardiovascular management, given its ability to activate multiple muscle groups and produce cardiovascular response similar to other vigorous exercises.^(18,19)

Significant results were found on physical strength, physical endurance, and functional fitness, besides cardiovascular fitness. An organized hardstyle kettlebell training program demonstrated high adherence and resulted in improvements on grip strength, muscular endurance, and cardiorespiratory fitness of previously sedentary individuals after a period of many weeks. Longer training programs that included kettlebell exercises were found to result in improvements on functional capacity, physical performance, and

body composition. These results lend credence to the effectiveness of kettlebell training as a flexible form of exercise that incorporates aerobic and resistance components, thus appropriate for improving physical fitness. ^(19,20,21)

In addition to that, comparative studies have also revealed that the physiological effects of kettlebell exercises are comparable to those of other forms of exercise, such as body weight resistance, cycling, as well as other forms of fitness training. Some studies have also revealed that the physiological response to kettlebell exercises, such as the reduction of peak heart rate during exercise routines, as well as the improvement of oxygen uptake, although not significant when kettlebell exercises were integrated into conventional forms of athletic training, could be beneficial as an alternative form of exercise. ⁽²¹⁾

All things considered, the data points to the safety and efficacy of kettlebell exercises when carried out under proper supervision and training. Kettlebell workouts, particularly swings, squats, and Turkish get-ups, are dynamic enough to engage the musculoskeletal and cardiovascular systems simultaneously. Kettlebell training is a viable option for improving cardiovascular health and fitness in healthy individuals because of these two advantages. ^(22,23)

Kettlebell exercises, by integrating both aerobic and anaerobic energy systems in exercises involving high-intensity movements in various planes of motion, induce substantial cardiovascular and physiological changes in healthy individuals and recreationally active adults. Exercises like kettlebell swings and kettlebell snatches elicit heart rates at 80-93% of maximum, increase VO₂max by 8-15% over 4-12 weeks, and increase cardiac output and oxygen consumption due to sustained metabolic stress, similar to that of moderate-intensity cycling or running. ^(24,25)

Kruszewski et al. examined the efficiency qualities that kettlebell training and traditional American football skills could generate in amateur sportspersons over the course of eight months. The main findings revealed that there were no significant differences in speed (40-yard run), most agility (arch run), jumping capacity, and power like long jump between the kettlebell and football groups, consisting of 12 sportspersons each. This reveals that kettlebell training is quite successful in enhancing these physical qualities that are essential for football. ⁽⁵⁾

However, kettlebell training resulted in a poorer outcome in one shuttle run test for agility ($p < 0.05$) and in developing strength endurance in a bench press at 100 kg, indicating a limitation in developing peak strength. The results support the fact that kettlebell training is a valuable addition for fitness improvement, including developing peak power output and speed, and that the dynamic movements help in developing cardiovascular fitness through higher heart rates. In conclusion, for all-encompassing benefits, kettlebell training should be used in conjunction with barbell training rather than instead of it. ⁽⁵⁾

Govindasamy et al. designed a study, a randomized controlled trial, in which a control group (CG) was compared with 60 obese young male adults who were administered 12 weeks of kettlebell resistance training (KRTG) in contrast to bodyweight resistance training (BWRTG). Though both interventions enhanced muscular endurance, flexibility, and cardiovascular endurance by increasing VO₂max values, both interventions showed a reduction in body fat percentage, body mass, and BMI. In contrast to bodyweight resistance training, kettlebell resistance training significantly enhanced vital capacity, reduced heart rate, respiratory rate, and increased breath-holding capacity. ⁽⁶⁾ Both also reduced their levels of LDL and total cholesterol, which helped in the improvement of metabolic health. The findings in this study show the effectiveness of kettlebell exercises in improving cardiovascular fitness and functional fitness in obese individuals through high-intensity exercises involving multiple joints that mimic real-life situations and provide insights into cardiovascular fitness in healthy individuals. ⁽⁶⁾

Chan et al. investigated the cardiovascular requirements of high-repetition kettlebell snatch exercises in recreationally active participants by using a 16-kg kettlebell in a simulated sport of Girevoy sport with 10 sets of 50 repetitions per arm with short intervals of rest between repetitions. Indirect calorimetry was used to monitor heart rate, oxygen consumption, blood lactate, respiratory exchange ratio, and energy cost during the entire session of the experiment. The results showed severe cardiorespiratory stress, which was confirmed by average heart rate values of 165 to 170 bpm, or 90% of maximum, average oxygen consumption values of 35 to 40 mL·kg⁻¹·min⁻¹, or 70 to 80% of maximum oxygen consumption, average respiratory exchange ratio values greater than 1.10, which confirmed high anaerobic glycolytic reliance, average lactate values greater than 12 mmol·L⁻¹ after exercise, and high energy costs greater than 20 kcal·min⁻¹. ⁽⁹⁾

The findings from this study clearly illustrate the potential for kettlebell snatches to create a high-intensity anaerobic and aerobic demand, creating a significant cardiovascular strain similar to a competitive event in endurance sports. As a result, by creating a prolonged increase in heart rate and oxygen consumption, this activity has the potential for enhancing cardiovascular fitness and cardiorespiratory endurance in a healthy individual. ⁽⁹⁾

Melo et al. examined the impacts of the addition of a 4-week kettlebell swing (KB) program to regular skill training (REGULAR+KB) as opposed to regular training alone (REGULAR) on cardiorespiratory fitness, demands, and recovery during simulated competitions in young female artistic gymnasts (13 ± 2 years). Methodology consisted of pre and post-intervention evaluations including ramp cycle ergometry for V_O₂(2max), and simulated routines consisting of vault, bars, beam, and floor events using breath-by-breath analysis for extrapolated peak V_O₂(V_O₂ext), heart rate (HR), and capillary lactate. All evaluations resulted in reduced peak heart rates during routines and post-1 min lactate ¹, with floor routines having the highest demands. Although energy expenditure was increased in all evaluations, the addition of KB resulted in increased V_O₂(2max). ⁽¹²⁾

As we can see, these results demonstrate just how effective kettlebell swings are in increasing cardiorespiratory and metabolic stress, which is comparable to gymnastics for fitness by increasing aerobic capacity and decreasing reaction time. Generally, by speeding up phosphocreatine resynthesis and recovery, we are improving cardiovascular fitness in healthy young people.⁽¹²⁾

In a study by Andrew Wong and colleagues, There is significant cardiovascular and autonomic reactions during an acute bout of kettlebell exercises are attributed to the high-intensity movement patterns experienced during kettlebell exercises . The results from heart rate variability analysis revealed significant changes in autonomic regulation in kettlebell exercises, including increased sympathetic nervous activity and transient suppression of parasympathetic modulation immediately after exercise. The reactions are followed by temporary increases in blood pressure and heart rate, which are normal reactions during resistance training or functional exercises.⁽¹⁸⁾

However, it was also observed that there was a slow return of parasympathetic activity during the entire recovery period, which indicated successful autonomic recovery and cardiovascular control after the exercise stimulus (Wong et al., 2021). Similar results were observed by John A. Falatic et al., which indicated that kettlebell training may improve cardiovascular performance and aerobic capacity due to its combined aerobic and resistance demands (Falatic et al., 2015). All of these results indicate that it is possible to improve cardiovascular fitness and autonomic balance in healthy humans by using kettlebell exercises as a type of high-intensity functional training.⁽¹⁸⁾

Heart rate variability is improved by autonomic nervous system changes, showing increased parasympathetic activity and reduced sympathetic dominance with prolonged training, whereas blood pressure shows initial peaks followed by post-exercise hypotension. Because of the stimulation of large muscle groups such as the glutes, core, and posterior chain, muscular endurance and energy expenditure can be maximized by up to 20 kcal/min during movements that encourage neuromuscular activation and metabolic conditioning.^(26,27)

Physiologically, the ballistic movements involved in the training with the kettlebell create a special cardiovascular load that incorporates the benefits of oxidative aerobic and glycolytic anaerobic energy production, leading to the development of mitochondrial biogenesis, stroke volume, and capillary density in the skeletal muscles. The effectiveness of the training in the promotion of cardiovascular health is supported through the mechanisms that minimize joint stress in healthy individuals while providing efficient conditioning through the use of this method.⁽²⁸⁾

5. Conclusion

The use of kettlebell exercises appears to be an effective tool for improving cardiovascular health, muscle strength, muscle endurance, and overall fitness in healthy people. This is based on the available research on kettlebell exercises. According to the available research on kettlebell exercises, cardiovascular responses to kettlebell exercises can be compared to those of other exercises. It was also noted that kettlebell exercises are safe, fun, and flexible enough to accommodate different training environments. Therefore, kettlebell workouts can be noted as an important component of exercise programs aimed at improving overall health and cardiovascular fitness in healthy people.

6. Scope of the Study

An overview of recent studies on kettlebell activity and the possible effects on cardiovascular health in healthy individuals is provided in the following. The findings reveal the interest in kettlebell-based training. In order to understand the long-term cardiovascular benefits of kettlebell training, more studies with larger sample sizes, longer training periods, and standardized training protocols are needed. In order to increase the use of kettlebell training for fitness and health programs, more studies on the effectiveness of kettlebell training for different age groups, sports groups, and rehabilitation settings may be conducted.

7. Limitations of the study

While interpreting the findings of this scoping review, it is essential to consider a few limitations. Only six articles out of an approximate 1,540 articles identified through PubMed, Google Scholar, and ResearchGate met the inclusion criteria, which shows there is still a scarcity of research on this topic. The difficulty in comparing the articles is due to the varying methods, kettlebell training regimens, and sample and intervention duration of the selected articles. It is also hard to conclude the long-term cardiovascular effects of kettlebell training since the sample and intervention duration of the articles were small.

In addition, only English-language papers were used for the review, which may also have caused publishing and language bias. In order to better understand the cardiovascular benefits of kettlebell exercises, more well-designed and long-term studies with larger and more diverse populations are needed. Thus, the results should be interpreted with caution.

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