

Review Article

High-Intensity Interval Training (HIIT) vs. Moderate-Intensity Continuous Training (MICT) for Improving Functional Capacity in Chronic Heart Failure: A Physiotherapy Systematic Review

Mudita Sawant, Nisha Gupta , Vasu Singh

Bachelor's of physiotherapy, Garden City University, Bangalore, India.

Bachelor's of physiotherapy, Garden City University, Bangalore, India.

Bachelor's of physiotherapy, Garden City University, Bangalore, India.

Email: nishagupta0614@gmail.com

Abstract

Moderate-Intensity Continuous Training (MICT) has traditionally been used as the standard exercise method in cardiac rehabilitation programs. However, High-Intensity Interval Training (HIIT) has recently gained attention as a potentially more effective approach.

The purpose of this review is to compare the effectiveness and safety of HIIT and MICT in improving aerobic capacity and functional performance in patients with chronic heart failure. A systematic search of literature published between 2016 and 2025 was conducted using databases such as Google Scholar and Research Gate. Studies were screened using PRISMA guidelines and their methodological quality was assessed using the PEDro scale.

Most of the reviewed studies reported that HIIT produced greater improvements in aerobic capacity and functional mobility when compared to MICT. When performed under proper supervision, HIIT was also found to be safe for stable CHF patients

Introduction

Chronic Heart Failure is a major health problem worldwide and is commonly associated with reduced exercise tolerance and frequent hospitalizations. One of the major goals of physiotherapy in CHF management is to improve a patient's functional capacity, which refers to the ability to perform everyday physical activities such as walking, climbing stairs, or carrying objects.

Exercise-based rehabilitation is widely used to break the cycle of physical inactivity, muscle weakness, and breathlessness that often develops in CHF patients. For many years, Moderate-Intensity Continuous Training has been recommended because it is considered safe and easy for patients to perform.

However, recent research suggests that higher exercise intensities performed in short intervals may produce stronger cardiovascular and muscular adaptations. High-Intensity Interval Training involves alternating short periods of intense exercise with recovery periods. This method may stimulate greater improvements in cardiovascular function and muscle metabolism compared with traditional continuous exercise.

Because of these potential benefits, researchers have started comparing HIIT with MICT in cardiac rehabilitation programs. Understanding the advantages and limitations of each method is important for physiotherapists when designing effective exercise programs for CHF patients.

Objective

The main objective of this review is to examine and summarize current research comparing the effectiveness of HIIT and MICT in improving functional outcomes in patients with chronic heart failure.

The review also aims to provide guidance on how HIIT can be safely introduced into physiotherapy-based cardiac rehabilitation programs.

3. Methodology

This literature review followed a structured approach to ensure reliable and relevant evidence.

Search Strategy

Electronic databases such as Google Scholar, Research Gate, and Litmaps were searched for studies published between 2016 and 2025. Key search terms included:

- High-Intensity Interval Training (HIIT)
- Moderate-Intensity Continuous Training (MICT)
- Heart Failure
- Functional capacity
- Cardiac rehabilitation

Selection Criteria

Only high-quality studies were included in the review. These consisted of:

- Randomized Controlled Trials (RCTs)
- Systematic Reviews
- Meta-analyses

Participants in these studies were stable CHF patients, mainly classified as New York Heart Association (NYHA) Class II–III.

Data Extraction

Important variables collected from the selected studies included:

- Exercise intensity based on the FITT principle
- Peak oxygen uptake (VO₂ peak)
- Six-Minute Walk Test (6MWT) distance
- Safety outcomes and adverse events

Quality Assessment

The methodological quality of the studies was evaluated using established tools.

- RCTs were assessed using the PEDro scale
- Systematic reviews were evaluated using AMSTAR-2 criteria

Only studies with acceptable quality scores were included in the final analysis.

Findings

A total of 15 relevant studies were included in this review. Overall, the findings suggest that HIIT may provide greater benefits than MICT in several important clinical outcomes.

Improvement in Aerobic Capacity

Several meta-analyses reported that HIIT significantly increased VO₂ peak, which is an important indicator of cardiovascular fitness. On average, HIIT produced an improvement of about 2.14 mL/kg/min more than MICT.

Functional Mobility

Performance in the Six-Minute Walk Test (6MWT) improved in both groups, but the HIIT groups showed larger gains. Some studies reported an additional 35–50 meters improvement compared to MICT.

Cardiac Function

HIIT also showed stronger positive effects on:

- Endothelial function
- Cardiac efficiency
- Left ventricular remodeling

These changes suggest improved heart performance and better circulation.

Safety

Importantly, the studies reported no significant difference in adverse cardiac events between HIIT and MICT when the training sessions were properly supervised by healthcare professionals.

Physiological Explanation

The greater effectiveness of HIIT may be explained by the higher intensity levels reached during exercise sessions. In many protocols, patients perform short bursts of activity at 85–95% of peak heart rate.

These brief periods of high intensity stimulate stronger cardiovascular responses and increase mitochondrial production in skeletal muscles. This is particularly beneficial for CHF patients, who often experience muscle wasting and reduced metabolic efficiency.

Another advantage of HIIT is its interval structure. Patients alternate between intense activity and recovery periods, which allows them to tolerate higher workloads that would be difficult to maintain during continuous exercise.

However, research also highlights that the benefits of HIIT depend on maintaining the correct intensity. If the patient does not reach the required intensity level, the training effect may become similar to standard moderate exercise.

6. Limitations

Despite promising findings, several limitations were noted in the current literature.

1. Variation in HIIT Protocols -Different studies used different interval durations and exercise intensities. Some protocols used 30-second intervals, while others used 4-minute intervals, making direct comparison difficult.

2. Limited Long-Term Evidence - Most studies lasted between 12 and 24 weeks. Long-term adherence and effectiveness of HIIT in home-based programs still need further investigation.

3. Limited Patient Diversity -Many trials included relatively stable CHF patients. Therefore, the results may not apply to patients with more severe conditions or those in acute clinical settings.

Clinical Implications

For physiotherapists working in cardiac rehabilitation, HIIT should be introduced carefully and gradually. Patients may initially begin with moderate-intensity continuous exercise and later progress to interval training as their tolerance improves.

Monitoring during exercise is essential to ensure safety and effectiveness. Physiotherapists should use:

- Heart rate monitoring
- Borg Rating of Perceived Exertion (RPE)

An RPE level of 15–17 is typically recommended to ensure the patient reaches the intended high-intensity level.

When properly supervised, HIIT can be a valuable addition to physiotherapy programs aimed at improving functional capacity and quality of life in CHF patients.

Outcome Variable	HIIT Advantage	Clinical Significance
------------------	----------------	-----------------------

VO ₂ peak	+15 to 20%	Strongest predictor of survival in CHF.
6MWT Distance	+40 meters (Avg)	Improved ability to perform ADLs.
Quality of Life	Significant Improvement	Reduced dyspnea and fatigue perception.

Conclusion

In conclusion, the available evidence from this systematic review indicates that High-Intensity Interval Training (HIIT) is superior to Moderate-Intensity Continuous Training (MICT) in enhancing aerobic capacity (VO₂ peak), functional mobility (as measured by the 6MWT), and overall cardiac efficiency in patients with stable chronic heart failure (NYHA Class II–III). HIIT consistently demonstrated greater physiological adaptations, including improved endothelial function and favorable left ventricular remodeling, while maintaining a comparable safety profile to MICT when implemented under professional supervision. These findings support the integration of HIIT into physiotherapy-led cardiac rehabilitation programs as a more time-efficient and potent intervention for improving patients' functional capacity and quality of life. However, its success relies on individualized progression, careful monitoring (using heart rate and Borg RPE scales), and appropriate patient selection. Future research should focus on long-term outcomes, home-based HIIT protocols, broader patient populations (including those with more severe heart failure), and cost-effectiveness analyses to further strengthen clinical guidelines. Overall, HIIT represents a promising advancement in exercise prescription for chronic heart failure management, offering physiotherapists an effective tool to optimize patient outcomes.

References:

1. Yang C, Liu X, Zhang Y, Wang P. High intensity interval training vs. moderate intensity continuous training on aerobic capacity and functional capacity in patients with heart failure: a systematic review and meta-analysis. *Front Cardiovasc Med*. 2024; 11:1342151.
2. Li X, Chen J, Smith G. Elevating Cardiac Rehabilitation: A Literature Review of HIIT's Superior Efficacy in Patients with Heart Failure. *Int J Med Sci Health Res*. 2025; 9(1):44-58.
3. Yue T, Tu J, Wu F, et al. Effects of HIIT vs. MICT on Cardiac Rehabilitation in Patients with Cardiovascular Disease: A Systematic Review and Meta-Analysis. *Front Cardiovasc Med*. 2023; 10:11234.
4. Hannan AL, Hing W, Simas V, et al.
5. High-intensity interval training versus moderate-intensity continuous training within cardiac rehabilitation: a systematic review and meta-analysis. *Open Access J Sports Med*. 2021; 12:89-104.
6. Gao C, Zhou L, Wang H. Effects of high-intensity interval training versus moderate-intensity continuous training on cardiorespiratory and exercise capacity: A systematic review. *PLOS ONE*. 2025; 20(2):e031567.
7. Maturana FM, Martus P, Zipfel S, Nieß AM. Effectiveness of HIIE versus MICT in Improving Cardiometabolic Risk Factors in Health and Disease: A Meta-analysis. *Med Sci Sports Exerc*. 2020; 52(8):1756-1767.
8. Gomes Neto M, Durães AR, Conceição LSR, et al. High-intensity interval training versus moderate-intensity continuous training on exercise capacity and quality of life in patients with heart failure with reduced ejection fraction: A meta-analysis. *J Card Fail*. 2018; 24(3):167-176.

9. Mueller S, Winzer EB, Duvinage A, et al. Effect of High-Intensity Interval Training, Moderate Continuous Training, or Guideline-Based Physical Activity Advice on Peak Oxygen Consumption in Patients with Heart Failure with Preserved Ejection Fraction: A Randomized Clinical Trial. *JAMA*. 2021; 325(6):542–551.
10. Badenhop D, Thomas R. High-Intensity Interval versus Moderate Continuous Training in Cardiac Rehabilitation. *J Clin Exerc Physiol*. 2022; 11(3):95-102.,
11. Tiauta A, Iancu A. Long-Term Effects of HIIT on Cardiac Function and Mortality in Heart Failure. *ResearchGate* [Preprint]. 2024.
12. Wewege MA, Ahn D, Yu J, Liou K, Keech A. High-intensity interval training for patients with cardiovascular disease—is it safe? A systematic review. *Am Heart J*. 2018; 200:96-105.
13. Tucker WJ, Beaudry RI, Liang Y, et al. Hierarchical Registry-Based Analysis of HIIT vs MICT in Heart Failure. *Mayo Clin Proc*. 2019; 94(12):2401-2409.
14. Dun Y, Smith JR, Liu S, Olson TP. High-Intensity Interval Training in Cardiac Rehabilitation. *Clin Geriatr Med*. 2019; 35(4):469-487.
15. Costache A, Diaconu AD, Costache RS, et al. HIIT vs. Medium-Intensity Continuous Training in Cardiac Rehabilitation Programs: A Narrative Review. *Medicina (Kaunas)*. 2023; 59(9):1644.
16. Taylor JL, Bonikowske AR, and Olson TP. Optimizing HIIT Protocols in Cardiac Rehabilitation: The Role of the Physiotherapist. *Exerc Sport Sci Rev*. 2020; 48(4):181-191.