

Use of the 2-minute Stationary Walk Test in the Evaluation of Functional Capacity in Patients With Cardiovascular Diseases: a Systematic Review of the Literature

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Uso de la Prueba de Marcha Estacionaria de 2 Minutos en la Evaluación de la Capacidad Funcional en Pacientes con Enfermedades Cardiovasculares: Una Revisión Sistemática de la Literatura

RESUMO

Objetivo: Analisar evidências científicas sobre a aplicação do Teste de Marcha Estacionária de 2 Minutos (TME-2min) em indivíduos com doenças cardiovasculares, com foco na confiabilidade, aplicabilidade clínica e uso em programas de reabilitação cardíaca. **Método:** Revisão sistemática baseada em artigos publicados entre 2014 e 2024 nas bases PubMed, Scopus, Web of Science e SciELO. Foram utilizados os descritores "2-minute step test", "functionalcapacity", "heartfailure", "coronaryarterydisease", "cardiacrehabilitation", "validity", "reliability" e "cardiovascular diseases". Aplicaram-se critérios de inclusão e exclusão previamente definidos. A avaliação da qualidade metodológica foi realizada por dois revisores independentes. **Resultados:** Após triagem de 203 estudos, 13 artigos preencheram os critérios de elegibilidade. Os estudos selecionados apontaram para boa confiabilidade do TME2min, especialmente em pacientes idosos com insuficiência cardíaca, doença arterial coronariana e em reabilitação cardíaca. Além disso, o teste demonstrou boa aplicabilidade clínica em diferentes contextos ambulatoriais. **Conclusão:** O TME2min é uma ferramenta viável, confiável e clinicamente útil na avaliação da capacidade funcional em populações cardiovasculares, sendo uma alternativa mais acessível e prática em ambientes com recursos limitados.

DESCRITORES: Teste de marcha estacionária de 2 minutos; capacidade funcional; reabilitação cardíaca; doenças cardiovasculares; avaliação funcional.

ABSTRACT

Objective: To analyze the available scientific evidence on the application of the 2-Minute Stationary Gait Test (2MST) in individuals with cardiovascular diseases, focusing on its validity, reliability, clinical applicability and use in cardiac rehabilitation programs. **Method:** Systematic review based on original articles published between 2014 and 2024 in the PubMed, Scopus, Web of Science and SciELO databases. The descriptors "2-minute step test", "functionalcapacity", "heartfailure", "coronaryarterydisease", "cardiacrehabilitation", "validity", "reliability" and "cardiovascular diseases" were used. Previously defined inclusion and exclusion criteria were applied. The methodological quality assessment was performed by two independent reviewers. **Results:** After screening 203 studies, 13 articles met the eligibility criteria. The selected studies indicated good concurrent validity and reliability of the 2MWT, especially in elderly patients with heart failure, coronary artery disease and in cardiac rehabilitation. In addition, the test demonstrated good clinical applicability in different outpatient settings. **Conclusion:** The 2MWT is a viable, reliable and clinically useful tool for assessing functional capacity in cardiovascular populations, being a more accessible and practical alternative in settings with limited resources.

DESCRIPTORS: 2-minute stationary gait test; functional capacity; cardiac rehabilitation; cardiovascular diseases; functional assessment.

RESUMEN

Objetivo: Analizar la evidencia científica disponible sobre la aplicación de la Prueba de Marcha Estacionaria de 2 Minutos (2MST) en personas con enfermedades cardiovasculares, centrándose en su validez, fiabilidad, aplicabilidad clínica y uso en programas de rehabilitación cardíaca. **Método:** Revisión sistemática basada en artículos originales publicados entre 2014 y 2024 en las bases de datos PubMed, Scopus, Web of Science y SciELO. Se utilizaron los descriptores "2-minute step test", "functionalcapacity", "heartfailure", "coronaryarterydisease", "cardiacrehabilitation", "validity", "reliability" y "cardiovascular patients". Se aplicaron criterios de

Literature Review

Abdala SL, Coelho VM, Costa CEG, Andrade LC

Use of the 2-minute Stationary Walk Test in the Evaluation of Functional Capacity in Patients With Cardiovascular Diseases: a Systematic Review of the Literature

inclusión y exclusión previamente definidos. La evaluación de la calidad metodológica fue realizada por dos revisores independientes. **Resultados:** Tras la evaluación de 203 estudios, 13 artículos cumplieron los criterios de elegibilidad. Los estudios seleccionados indicaron una buena validez concurrente y fiabilidad de la prueba 2MWT, especialmente en pacientes de edad avanzada con insuficiencia cardíaca, enfermedad coronaria y en rehabilitación cardíaca. Además, la prueba demostró una buena aplicabilidad clínica en diferentes entornos ambulatorios. **Conclusión:** La prueba 2MWT es una herramienta viable, fiable y clínicamente útil para evaluar la capacidad funcional en poblaciones cardiovasculares, siendo una alternativa más accesible y práctica en entornos con recursos limitados.

DESCRIPTORES: Prueba de marcha estacionaria de 2 minutos; capacidad funcional; rehabilitación cardíaca; enfermedades cardiovasculares; evaluación funcional

RECEIVED: 07/14/2025 APPROVED: 07/30/2025

How to cite this article: Abdala SL, Coelho VM, Costa CEG, Andrade LC. Use of the 2-minute Stationary Walk Test in the Evaluation of Functional Capacity in Patients With Cardiovascular Diseases: a Systematic Review of the Literature. *Saúde Coletiva* (Edição Brasileira) [Internet]. 2025 [acesso ano mês dia];15(99):16902-16911. Disponível em: DOI: 10.36489/saudecoletiva.2025v15i99p16902-16911

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INTRODUCTION

Cardiovascular diseases remain the leading cause of death in Brazil and worldwide, in addition to contributing to functional decline and limitations in activities of daily living (ADLs). Cardiovascular rehabilitation (CVR) is known to be essential care for patients with these diseases so that they can progress and develop their abilities⁽⁸⁾. This activity has a Class I recommendation from the American Heart Association, the European Society of Cardiology, and the Brazilian Association of Cardiology⁽⁷⁾.

In view of this, we know that the most efficient way to infer the evolution of individuals undergoing CR is through the Exercise Stress Test. However, its high cost, associated with the scarcity of places to perform it, makes it inaccessible, and there is also a need

for physical infrastructure that is not usually found in closed hospital units.

One of the most reliable ways to confirm the results of CR is by assessing the functional capacity of individuals⁽⁵⁾; this assessment allows inferences to be made about progress made in treatment.

Functional capacity should be assessed using practical, reliable, and validated tools. Among the submaximal tests available, the 6-Minute Walk Test⁽¹⁾ stands out. However, its use may be limited in environments with restricted physical space or with patients who require continuous monitoring.

The Two-Minute Stationary Walk Test (TME2min) emerges as a viable alternative, especially in hospital settings with space limitations. It is low cost, easy to perform, less stressful for the patient, and feasible for application in various contexts⁽¹³⁾.

Articles indicate that the TME-2min correlates with other established tests such as the TC6M and the Time Up and Go (TUG), and is useful for assessing cardiovascular endurance and functional mobility⁽⁴⁾.

Although there are still gaps in its standardization and interpretation, the 2-min WMT has shown good correlation with muscle fatigue and cardiac function, demonstrating its usefulness as a safe and efficient alternative to the 6MWT⁽²⁾.

Therefore, the 2-min WMT is promising, reproducible, correlates with established tests, and is applicable in complex hospital settings. This systematic review aims to compile and critically analyze studies on the use of the 2-min WMT in populations with CVD, focusing on its validity, reliability, clinical applicability, and ability to reflect functional changes in cardiac

rehabilitation programs.

Due to the mortality and, above all, morbidity associated with cardiovascular diseases, it is appropriate to call for intra-hospital analysis as a way of inferring the functionality of individuals admitted to hospital due to complications from their conditions, which currently prevent them from continuing their daily activities. Assessment with non-invasive and safe instruments that have a high degree of correlation with provocative inferences allows the multidisciplinary team to identify needs and set short- and medium-term goals, as well as making treatment associated with patient recovery more assertive, effective, rapid, and safe.

Therefore, this study is justified because it can offer a robust framework of information that will contribute to technical and scientific advances in the management of patients at the time of their hospitalization, providing even more layers and quality of approach to these individuals.

The objective of this literature review was to analyze the available evidence on the use of the 2-Minute Stationary Walk Test (2MWWT) in assessing the functional capacity of patients with cardiovascular diseases, with an emphasis on its validity, reliability, clinical applicability, and usefulness in rehabilitation contexts.

METHOD

To develop this study, we used a systematic review methodology conducted according to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines.

The search was conducted in the following electronic databases: PubMed, Scopus, Web of Science, and SciELO. Initially, keywords were defined on the DeCS platform in English: “2-minute step test,” “functional capacity,” “heart failure,” “coronary artery disease,” “cardiac rehabilitation,” “validity,” “reli-

ability,” and “cardiovascular diseases.”

The selections were made by two groups of independent researchers and, in cases of disagreement, a third reviewer analyzed the results through discussion or arbitration. The quality of the studies was assessed using the PEDro scale for clinical trials and the Newcastle-Ottawa scale for observational studies. High-quality studies were prioritized in the discussion of the findings.

Studies published between 2014 and 2024 that met the following criteria were included: Original studies with humans; populations with CVD (heart failure, coronary artery disease, cardiac rehabilitation); use of the 2-min MMT; quantitative studies (observational, clinical trials); assessment of the validity, reliability, and clinical applicability of the test.

Articles that did not directly address the topics of interest, reviews,

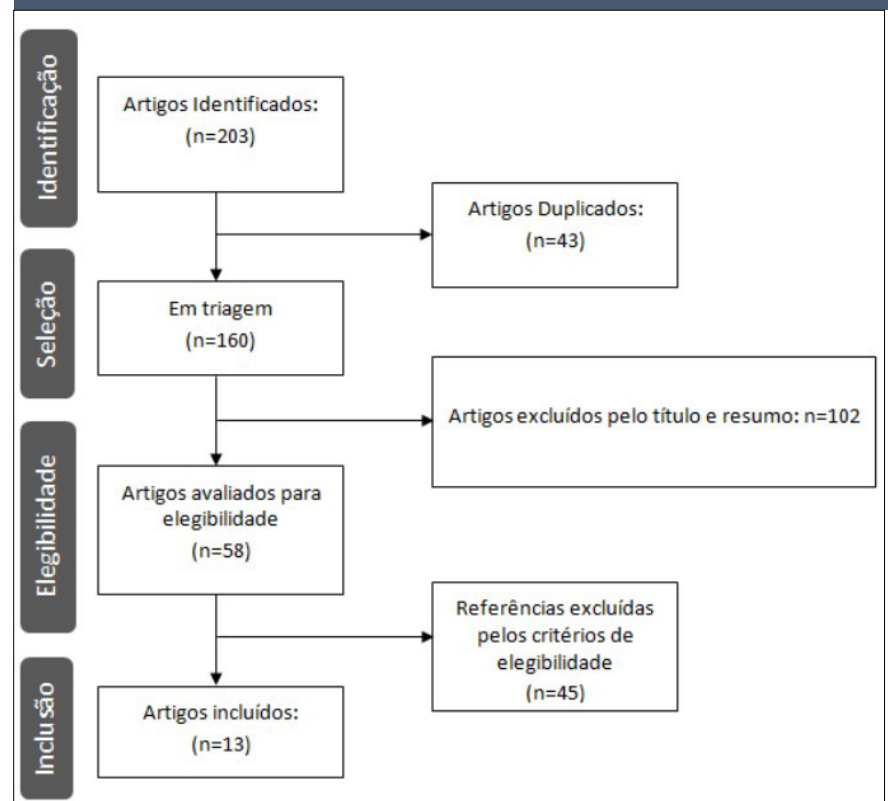
editorials, letters to the editor, theses, and dissertations, as well as those lacking quantitative data or access to the full text, were excluded.

RESULTS

A total of 203 studies were identified. After removing duplicates (n=43), 160 articles were screened by evaluating titles and abstracts. Of these, 58 were evaluated in full, resulting in 13 studies included. Among the 13 included studies, 8 were observational and 5 were clinical trials (3 controlled and 2 multicenter). The populations analyzed included: Heart failure (n=5); Cardiac rehabilitation (n=4); Peripheral arterial disease (n=2); Post-cardiac surgery (n=2).

Figure 1 shows the flowchart of the plan adopted for searching, inclusion, and exclusion of texts not included.

Figure 1 - Detailed flowchart of the method applied in the selection of articles.



Literature Review

Abdala SL, Coelho VM, Costa CEG, Andrade LC

Use of the 2-minute Stationary Walk Test in the Evaluation of Functional Capacity in Patients With Cardiovascular Diseases: a Systematic Review of the Literature

Table 1. Methodological characteristics of the included studies

Author (Year)	Type of Study	Population	Sample	Main Objective	Main Evaluation
Braghieri et al. (2019)	Observational	Peripheral arterial disease	40	Reproducibility and correlation with other tests	Reproducibility
Campos et al. (2023)	Observational	Elderly heart patients	52	Comparison of TME2min vs TC6min	Concurrent validity
Campos FC et al. (2023)	Observational	Elderly patients undergoing cardiac rehabilitation	45	Correlation between TME2min and TC6min	Concurrent validity
Cortez et al. (2014)	Observational	Hypertensive	60	To assess functional capacity with 2-minute TME	Clinical applicability
Ferreira et al. (2014)	Observational	<i>Frail elderly</i>	33	Physical rehabilitation using 2-minute WMT	Clinical applicability
Forman et al. (2017)	Clinical trial	Elderly people with CVD	100	Functional tests as clinical outcome	Clinical functionality
Guedes et al. (2015)	Observational	Hypertensive elderly	45	Validation of the 2-minute TME	Validity
Junglos et al. (2024)	Clinical trial	Post-cardiac surgery	72	Safety and reproducibility of TME2min	Reliability
Pedrosa & Holanda (2009)	Observational	Elderly women with hypertension	35	Correlation between functional tests	Validity
Lima et al. (2021)	Clinical trial	Heart failure	80	Impact of TME2min after cardiac rehabilitation	Validity and responsiveness
Andrade et al. (2020)	Clinical trial	Outpatient cardiac rehabilitation	60	Compare progress with TME2min and TC6min	Validity and applicability
Santos et al. (2018)	Observational	Post-acute heart disease	50	Applicability and safety of 2-minute TME	Clinical applicability

Table 2. Levels of Evidence of Included Studies

Author (Year)	Type of Study	Level of Evidence*
Braghieri et al. (2019)	Observational	IV
Campos et al. (2023)	Observational	IV
Campos FC et al. (2023)	Observational	IV
Cortez et al. (2014)	Observational	IV
Ferreira et al. (2014)	Observational	IV
Forman et al. (2017)	Clinical trial	II
Guedes et al. (2015)	Observational	IV
Junglos et al. (2024)	Clinical trial	II
Pedrosa & Holanda (2009)	Observational	IV
Lima et al. (2021)	Clinical trial	II
Andrade et al. (2020)	Clinical trial	II
Santos et al. (2018)	Observational	IV
Ribeiro et al. (2022)	Observational	IV

Results of qualitative approach:

Classification based on the Oxford Centre for Evidence-Based Medicine levels of evidence: I – Evidence from systematic review of RCTs; II – Evidence from at least one RCT; III – Cohort study; IV – Case-control or observational study; V – Expert opinion.

DISCUSSION

The findings of this systematic re-

view indicate that the 2-minute walk test (2MWT) is a valid, reliable, and clinically applicable tool for assessing functional capacity in patients with cardiovascular disease. The included studies addressed different clinical contexts, such as heart failure, cardiac rehabilitation, postoperative, and peripheral arterial disease, demonstrating consistency in results.

The concurrent validity of the 2MWT was mainly evidenced by its correlation

with the 6-Minute Walk Test (6MWT) and relevant physiological variables, such as peak oxygen consumption (VO_2 peak). Studies have demonstrated a significant correlation between the TME2min and these outcomes, suggesting that the test can be used as a practical substitute for more complex assessments, especially in outpatient settings⁽⁵⁻⁹⁾.

Inter- and intra-examiner reliability has been confirmed in studies⁽¹⁰⁾, demonstrating consistency in the results of the 2-min WMT when applied to different populations and clinical conditions. The satisfactory reproducibility of the test strengthens its application in routine clinical settings.

The applicability of the 2-min WMT has been highlighted in rehabilitation and functional assessment settings for older adults⁽⁶⁻⁷⁾. In addition, studies have shown that the test is sensitive to detecting functional changes over time, making it useful for monitoring clinical progress during rehabilitation programs⁽²⁻¹⁰⁾.

Studies have demonstrated that the 2-min WMT correlates well with traditional tests, has high inter- and intra-ex-

aminer reliability, is easy to administer and interpret, and can be used safely in different cardiovascular subgroups.

However, methodological limitations were observed, such as heterogeneity in application protocols, variations in samples, and lack of blinding in some studies.

This review has some limitations that should be considered. First, methodological heterogeneity between studies made quantitative comparison of findings difficult, preventing a meta-analysis. Second, the predominance of observational studies with small samples limits the generalization of the results. In addition, some studies did not use standardized protocols for the application of the 2-minute WMT, which may compromise the comparability of the data.

Another limiting factor was the exclusion of studies not available in full text and the restriction to English and Portuguese, which may have caused publication bias. Studies that evaluated the test in mixed

populations or with multiple comorbidities outside the cardiovascular scope were also not included, which reduces the scope of the conclusions.

Based on the findings of this review, the 2-Minute Walk Test (TME2min) is a useful and applicable tool in clinical practice for assessing functional capacity in patients with cardiovascular disease. Its ease of application, low cost, and good tolerability make it particularly advantageous in primary care services, rehabilitation centers, and home settings.

For clinical practice, the 2-min STT can be incorporated as a functional screening strategy and for monitoring progress during rehabilitation programs, including in elderly populations and those with reduced mobility. Its standardized application can aid in therapeutic decision-making and in the planning of individualized interventions.

Regarding future research, we recommend the development of multicenter

randomized clinical trials with greater methodological rigor, as well as studies that explore its sensitivity to clinical and prognostic changes at different stages of cardiovascular disease. Investigations comparing the 2-min TME with complex cardiopulmonary tests are also encouraged in order to consolidate its predictive validity and usefulness in different clinical settings.

CONCLUSION

The 2-Minute Stationary Walk Test is a valid, reliable, and easy-to-use tool for functional assessment of patients with cardiovascular disease. It is recommended as an alternative to the 6MWT in restricted settings or with frail patients. Further studies with greater methodological control and standardized protocols are needed to consolidate its use.

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