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A Systematic Review of Home-Based and Equipment-Free Fitness Tests: Feasibility, Accessibility, and Practicality

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Abstract

The growing public interest in independently monitoring physical fitness has encouraged the development of various home-based fitness testing methods that require no specialized equipment. However, the effectiveness and suitability of these methods have yet to be comprehensively evaluated. This study aims to identify and assess self-administered fitness tests that can be conducted at home, using a Systematic Literature Review guided by PRISMA protocols. A total of 200 articles from Google Scholar (2010–2024) were screened using five inclusion criteria. Eight empirical studies were selected and analyzed based on test content, equipment requirements, psychometric properties, and ease of implementation. The findings revealed two main approaches: minimal-equipment tests such as the 3-minute step-in-place and digital applications, and equipment-free tests based on bodyweight exercises such as FITescola®. While several methods proved practical and reliable, limitations were noted, including reliance on digital tools and the simplicity of certain tests that may affect measurement accuracy. This review offers a foundation for developing fitness testing guidelines applicable in physical education settings and broader health programs. In the context of Indonesia's diverse population, further research is needed to validate field effectiveness and ensure that testing methods remain inclusive, simple, and valid. Cross-sector collaboration is essential in producing practical solutions to support a healthier society.

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INTRODUCTION

Fitness testing has undergone significant advancements in parallel with the progress of science and technology (Zhamardiy et al., 2019; Keating et al., 2018; Fitri et al., 2025). Physical fitness assessments can be conducted either manually or with the aid of tools, depending on user needs and context (Kolimechkov, 2017). These tests typically consist of a series of evaluations designed to measure individual physical abilities across specific parameters such as endurance, strength, flexibility, and body composition (Kaminsky et al., 2013). A wide variety of methods and approaches are currently used in fitness testing, each offering different advantages and levels of accessibility (Kao et al., 2020).

Today, fitness tests continue to evolve with methods tailored to meet the needs of specific populations and settings (Coughlin et al., 2016). However, many testing methods still rely on specific equipment for their implementation. For example, sensor- and camera-based technologies enable real-time monitoring and movement analysis during physical activities (Chen et al., 2014; Cooper et al., 2018). Cardiovascular fitness tests often require tools such as treadmills or cycle ergometers (Kaminsky, 2017; Kling, 2018), and many also demand a large space due to the distance requirements of certain test protocols (Mae et al., 2024).

On the other hand, innovations such as mobile applications designed for fitness testing have been developed, though many are still in refinement stages (Li et al., 2021; Muntaner et al., 2019). Several studies have proposed simple and accessible testing methods, yet these are often overly basic and fail to provide sufficient challenge for a comprehensive fitness evaluation (Suk & Jang, 2020). Similarly, other research highlights the persistent dependence on specific equipment in the implementation of fitness tests (Wu et al., 2023; Domin et al., 2021; Abdullah et al., 2019). This reliance is particularly problematic in the context of modern lifestyles, where many individuals-due to high levels of productivity and time constraints-prefer to exercise at home with minimal equipment (Guthold et al., 2018; Ozlen et al., 2024).

To date, there have been few systematic reviews that specifically examine home-based and equipment-free fitness tests from the perspectives of ease of implementation, accessibility, and validity (Shaw & Shaw, 2021; DeGaris & Osadnik, 2020). Therefore, this study aims to conduct a Systematic Literature Review (SLR) of various fitness test methods that can be self-administered at home, including those that require no specialized equipment.

METHOD

The systematic approach used in this study is the Systematic Literature Review (SLR). This method involves two main processes: a comprehensive review and the systematic identification of relevant journal articles, guided by established protocols-specifically the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Tricco et al., 2018). Within the SLR framework, conducting a critical evaluation is essential, as it ensures the quality and relevance of the findings for the reader. Therefore, this study includes a rigorous appraisal process based on clearly defined inclusion and exclusion criteria. A PRISMA-based literature review provides three key benefits: 1) Clearly and methodically defining the research question, 2) Establishing specific inclusion and exclusion criteria, and, 3) Identifying scientific literature from targeted databases within a defined time frame (Azril et al., 2018).

This review utilized Google Scholar as its primary database. The platform offers an accessible and efficient way to locate relevant journal publications, allowing researchers to obtain essential literature through a straightforward and time-saving process (Mohamed et al., 2021).

During the screening phase, the researcher systematically selected literature to

Table 1. Search Process

Data Source	Keywords
Google Scholar	"*Fitness Test*"

summarize and extract documents relevant to the research focus. This process was followed by an eligibility assessment, in which articles were either included or excluded based on predefined criteria. Articles that had already been extensively reviewed in prior literature studies were excluded from this review to avoid duplication of analysis. The selection criteria used in this study were as follows: 1) Articles published between 2010 and 2024; 2) Empirical studies only-excluding review articles, books, and conference proceedings; 3)Studies examining fitness tests that require no specialized equipment and can be self-administered at home by the general public; 4) Articles written in either Indonesian or English; and 5) Publications indexed in Scopus or SINTA as indicators of scholarly quality (Putra et al., 2024).

The literature identification process in this study was conducted through a search on the Google Scholar database, which initially retrieved 200 articles. Of these, 20 were identified as duplicates and immediately removed, leaving 180 articles for the screening stage. During this phase, 155 articles were excluded—138 were unrelated to the topic of fitness testing, and 17 were inaccessible. The remaining 25 articles proceeded to the eligibility assessment stage for further evaluation. At this point, 15 articles were excluded for not meeting the selection criteria: six were conference papers, four were literature reviews, four were written in languages other than Indonesian or English, and three were not indexed in Scopus or SINTA. After a rigorous and systematic selection process, eight articles were found to meet all inclusion criteria and were incorporated into the final review.

RESULTS

Following a systematic screening process based on PRISMA guidelines, eight articles were identified as relevant to the topic of home-based fitness tests without the use of specialized equipment. These articles met the established criteria for ease of implementation, accessibility, and validity. The mapping of these articles, conducted through a structured literature search, was guided by predefined criteria derived from various reputable academic sources.

The inclusion criteria for this review consisted of articles published in journals indexed by SINTA or Scopus, released between 2010 and 2024, available on Google Scholar, and written in either Indonesian or English. The journals referenced in the selected articles include: Journal of Clinical Medicine, Frontiers in Sports and Active Living, Key Engineering Materials, Clinical Physiology and Functional Imaging, Applied Sciences, European Physical Education Review, Sports, International Journal of Environmental Research and Public Health, and JMIR Formative Research.

The content of the selected articles was analyzed based on the following elements: title, authors, year of publication, research methods, and key findings, as detailed below:

Table 2. Search Process

Criteria	Inklusi	Eksklusi
Time Range	Between 2010 and 2024	Before 2010 or after 2024
Document Type	Research articles	Review articles, books, and websites
Language	Indonesian and English	Other than Indonesian and English
Indexing	SINTA and Scopus	Not indexed in SINTA or Scopus

Table 3. Selected Studies

No	Tittle	Method	Type of Test	Type of Implementation	Result
1	Koźlenia, D., Popowczak, M., Szafraniec, R., Alvarez, C., & Domaradzki, J. (2024). Changes in Muscle Mass and Strength in Adolescents Following High-Intensity Functional Training with Bodyweight Resistance Exercises in Physical Education Lessons.	Experimental (pre-post test)	Bioelectrikal impedance dan hand grip strength test	Body-weight exercises: push-up, squat, lunges	This research highlights the effectiveness of a school-based HIFT program in promoting muscle mass gains and enhancing muscle strength among adolescents. The findings offer valuable insights for implementing bodyweight exercises during physical education classes.
2	Hendker, A., & Eils, E. (2021). A Group-Based 8-Week Functional Interval-Type Outdoor Training Program Improves Physical Performance in Recreationally Active Adults.	Experimental (pre-post test)	Incremental Treadmill Test, Core Stability Test dan Functional Fitness Test.	Body-weight and functional training combined with free weights	the interval training program produced significant increases in the intervention group (n = 43) in functional and strength exercises ($p < 0.001$; squat (+27%), burpee (+24%), bridge (+39%), push-up (+34%), sit-up (+25%), high knees (+25%), row (+19%), effect sizes 0.4–0.11) for almost all parameters in comparison to a non-intervention control population (n = 38). Interestingly, trunk stability increased significantly ($p < 0.001$; flexion (+86%), extension (+43%), lateral left (+39%), lateral right (+32%), effect sizes 0.3–0.15) even though it was not explicitly trained; this was rather a secondary outcome of the functional exercises
3	Henriques-Neto, D., Minderico, C., Peralta, M., Marques, A., & Sardinha, L. B. (2020). Test–retest reliability of physical fitness tests among young athletes: The FITescola® battery.	Descriptive quantitative (test-retest reliability)	The FITescola® battery test	Administered to young athletes from various sports	The battery of tests had good or excellent reliability and concordance of the ICC between the two trials (ICC ≥ 0.75) with exception for the 20 m speed run in girls that presented moderate reliability (ICC = 0.57). The Bland–Altman plots showed high reliability for all the fitness tests for both sexes. Hence, The FITescola® battery may be a novel tool to assess the physical fitness of large groups of young athletes from different sports backgrounds
4	Sá-Caputo, D., Taiar, R., Seixas, A., Sanudo, B., Sonza, A., & Bernardo-Filho, M. (2020). A proposal of physical performance tests adapted as home workout options during the COVID-19 pandemic.	Descriptive	Multiple tests adapted for home use (e.g., stair climb, sit-reach, 6MWT)	Adapted exercises for home settings during COVID-19.	Several exercises that consider the clinical conditions of the individuals and can reduce their sedentary behavior, considering COVID-19 confinement, are suggested to improve the population's quality of life.

Table 3. Systematic Review

No	Tittle	Method	Type of Test	Type of Implementation	Result
5	Keating, X., Liu, X., Stephenson, R., Guan, J., & Hodges, M. (2020). Student health-related fitness testing in school-based physical education: Strategies for student self-testing using technology.	Descriptive with technology-based tools	Fitness tests using RFID, push-up/ sit-up counters, apps	Digital self-assessment via multiple fitness applications	Self-testing approach could be used as part of a fitness education programme where students learn about HRF components, develop competence, and learn how to improve their HRF over time, absent of an expert evaluator to monitor their own HRF. The potential role of modern technology in solving some of the seemingly unsolvable problems with youth fitness testing in schools worldwide and facilitating the implementation of self-testing HRF in school-based PE programmes is also presented
6	Kapsis, D. P., Tsoukos, A., Psarraki, M. P., Douda, H. T., Smilios, I., & Bogdanis, G. C. (2022). Changes in body composition and strength after 12 weeks of high-intensity functional training with two different loads in physically active men and women: a randomized controlled study.	Randomized controlled trial (pre-post)	1-RM and bioelectrical impedance	HIFT with low and moderate resistance using free weightsatihan yang digunakan adalah latihan kekuatan menggunakan free-weight.	Twelve weeks of HIFT training with either low or moderate resistance and equal volume load resulted in an equal increase in LBM and maximal strength, but different fat loss.
7	Li, F., Chang, C. H., Chung, Y. C., Wu, H. J., Kan, N. W., ChangChien, W. S., ... & Huang, C. C. (2021). Development and validation of 3 min incremental step-in-place test for predicting maximal oxygen uptake in home settings: A submaximal exercise study to assess cardiorespiratory fitness.	Experimental	3 min incremental step-in-place (3MISP)	Self-conducted cardiovascular test at home	The 3 min incremental step-in-place test provides a safe, simple, and effective method of assessing cardiorespiratory fitness. It can be applied in the home setting as a cardiorespiratory fitness self-monitoring method for the general population.
8	Lin, I. I., Chen, Y. L., & Chuang, L. L. (2021). Test-Retest reliability of home-based fitness assessments using a Mobile app (R plus health) in healthy adults: prospective quantitative study.	Descriptive	The R Plus Health app in healthy adults.	App-based assessment at home	Home-based fitness assessments using the R Plus Health app were reliable and feasible in young, healthy adults. The results of the fitness assessments can offer a comprehensive understanding of general health status and help prescribe safe and suitable exercise training regimens.

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DISCUSSION

Home-Based Fitness Tests

As public awareness surrounding the importance of physical fitness continues to grow, particularly in the wake of heightened health consciousness globally, a growing body of research has focused on developing accessible methods for conducting fitness assessments within home environments. These approaches are designed to provide practical, cost-effective alternatives for individuals who may lack access to professional gyms or structured sports facilities, thereby promoting broader participation in health monitoring and self-regulated exercise routines. A number of studies have emphasized the viability of bodyweight-based fitness assessments, which require minimal equipment and are feasible for self-administration. A prominent example is the 3-minute step-in-place test, a modified cardiovascular endurance assessment aimed at evaluating aerobic capacity without the need for sophisticated devices such as treadmills or cycle ergometers (Li et al., 2021). Complementing this, the reliability testing of the FITescola® battery has demonstrated that a structured sequence of physical tests can be effectively administered at home with a high degree of reliability and reproducibility (Henriques-Neto et al., 2020).

In addition to traditional bodyweight-based methods, the integration of digital technology has introduced new paradigms for home-based fitness assessment. For instance, mobile health applications, such as R Plus Health, have been developed to assist users in independently conducting physical fitness evaluations through guided instructions and real-time feedback mechanisms (Lin et al., 2021). Such digital innovations enhance the autonomy and consistency of fitness testing while simultaneously expanding its reach across diverse demographic groups. Furthermore, structured home-based interval training programs have been empirically shown to yield significant improvements in cardiovascular fitness following as little as an eight-week training period (Hendker & Eils, 2021), underscoring the potential of remote exercise interventions.

Despite these advancements, several limitations remain. While home-based fitness assessments offer substantial advantages in terms of accessibility and flexibility, many protocols still necessitate supplementary equipment-such as step benches, cones, or digital applications-that may not be readily available in all households. This equipment dependency poses a barrier to universal implementation, particularly in resource-constrained settings. Consequently, there is a pressing need for further refinement of fitness testing protocols to ensure broader inclusivity, scalability, and ease of deployment across varying socio-economic and geographic contexts. Enhancing the equity of access to valid and reliable fitness assessments remains a critical objective in advancing public health and promoting lifelong physical activity engagement.

Fitness Tests Without Specialized Equipment

Beyond home-based fitness assessments that require specific tools or technological support, a growing area of interest in physical fitness research involves the development of equipment-free testing methods. These protocols are specifically designed to increase accessibility for individuals who do not possess exercise equipment or lack access to formal training facilities. By removing the need for specialized tools, these approaches aim to democratize physical activity and monitoring, particularly among populations facing economic or logistical constraints. One such method is bodyweight resistance training, which has been widely implemented in physical education contexts and has demonstrated measurable improvements in muscular strength and cardiovascular endurance among adolescents, without relying on any additional apparatus (Koźlenia et al., 2023). The necessity of such methods became especially evident during the COVID-19 pandemic, when home confinement prompted the development and adoption of bodyweight-based fitness assessments as practical alternatives to traditional

exercise regimes (Sá-Caputo et al., 2020).

The appeal of bodyweight-based fitness testing extends across age demographics. In gerontological exercise research, for example, bodyweight-focused evaluations have been adapted to prioritize safety, simplicity, and ease of implementation for older adults. Kapsis et al. (2022) demonstrated the effectiveness of such methods within elderly populations, providing evidence that fitness can be both assessed and improved without complex or physically demanding equipment. Nevertheless, not all bodyweight-based tests are equally appropriate across population segments. The design and validity of these protocols must be tailored to specific user profiles to avoid skewed results or overgeneralization, particularly when transitioning from youth-focused designs to senior populations.

Although the advantages of no-equipment fitness assessments are clear-particularly in terms of simplicity, low cost, and widespread applicability-there remain notable limitations and challenges. Some studies argue that certain simplified assessments may lack the sensitivity and comprehensiveness required to accurately capture all dimensions of physical fitness (Keating et al., 2020). In contrast, technology-supported models (Li et al., 2021; Lin et al., 2021) offer enhanced capabilities such as real-time feedback, personalized metrics, and longitudinal data tracking. However, they often fall short in contexts with limited digital literacy or inadequate technological infrastructure, thereby reducing their practical reach. On the other hand, while bodyweight-based approaches (Koźlenia et al., 2023) offer affordability and ease of use, they frequently lack the objectivity and quantification necessary for standardized assessment.

The issue of validity and reliability remains a central concern. To be considered viable for broader implementation, fitness tests-particularly those designed for home or resource-limited environments-must undergo rigorous evaluation to confirm their measurement accuracy and consistency across varied populations. Moreover, in countries like Indonesia, where significant disparities persist in access to both digital technologies and sports infrastructure, equipment-free models such as the FITescola® battery or bodyweight-based High-Intensity Functional Training (HIFT) may represent highly adaptable and equitable alternatives, particularly in rural and economically disadvantaged communities. These approaches offer promising solutions for advancing inclusive fitness assessment strategies that align with local resource capacities and population needs.

CONCLUSION

This systematic review reveals that home-based fitness test approaches-whether through digital applications or equipment-free bodyweight exercises-have rapidly emerged as alternative solutions in the post-pandemic era. Among the eight articles reviewed, bodyweight -based methods were generally more accessible, while digital approaches offered greater precision but were limited by technological access.

The primary challenges identified include issues of validity, the need for specific supporting tools, and the suitability of these methods within local contexts. In a diverse society like Indonesia, there is a pressing need to develop fitness test methods that are simple, valid, and easy to use. Achieving this goal requires synergy between researchers, educators, and policymakers to ensure that the developed methods are truly applicable and effective in improving the population's quality of life through physical fitness.

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