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Validity of the Sit and Reach Test for Hamstring and Low Back Flexibility: A Systematic Review

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ABSTRACT

The sit-and-reach test has been used extensively since its introduction in 1952 as a standard field-based assessment of hamstring and lower back flexibility. Despite its widespread application in physical education, sports training, and clinical settings, the construct validity of this test remains controversial in contemporary scientific literature, particularly when evaluated against objective biomechanical standards. This study aimed to regularly analyze and synthesize empirical evidence regarding the validity of the sit-and-reach test in measuring hamstring and lower back flexibility and to identify key factors contributing to variability in reported validity outcomes. A systematic literature review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Electronic searches were performed in PubMed, Scopus, and Google Scholar databases for studies published between 2021 and 2025. Six high-quality quantitative studies met the inclusion criteria, consisting of a total sample of 476 participants. Methodological quality was evaluated using a validated assessment tool, and findings were synthesized narratively due to study heterogeneity. The synthesis revealed that the validity of the sit-and-reach test is problematic, with consistently very low GRADE scores across studies. Correlations between sit-and-reach scores and objective isokinetic measures of hamstring function were only fair (r = 0.330–0.449), accounting for approximately 11–20% of the variance. Performance outcomes reflect a complex interaction of thoracic and lumbar spine mobility, hip flexion, and compensatory lower-extremity movements rather than isolated hamstring or lower back flexibility. Variations in validity were influenced by gender differences, testing protocols, and methodological rigor. Strong empirical evidence indicates that the sit-and-reach test lacks sufficient validity for specifically measuring hamstring and lower back flexibility in healthy adult populations, highlighting the need for more anatomically specific and biomechanically grounded assessment tools.

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INTRODUCTION

Flexibility is an essential component of physical fitness, playing a crucial role in supporting movement performance, biomechanical efficiency, and preventing musculoskeletal injuries. Physiologically, flexibility reflects the ability of muscle and

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connective tissue to undergo optimal elongation, allowing joints to move through their full range of motion without causing pain or structural damage (El-Sofany & El-Haggar, 2020; Behm et al., 2021). In the lower extremities, flexibility of the hamstring muscles and lower back region plays a strategic role because it is directly related to pelvic stability, postural control, and force transmission during functional activities and sports (Magnusson & Renström, 2022).

Anatomically, the hamstring muscle group—consisting of the biceps femoris, semitendinosus, and semimembranosus—functions as a knee flexor and pelvic stabilizer, while lower back flexibility is related to the function of the lumbar muscles and supporting structures of the spine (Johnson & Williams, 2023). Limited flexibility in this area has been linked to an increased risk of musculoskeletal disorders, particularly low back pain (LBP), which reportedly has a lifetime prevalence of up to 70–80% in the global adult population (Hartvigsen et al., 2018; Jaya et al., 2025). This condition makes hamstring and lower back flexibility an important parameter in the context of physical education, sports training, and medical rehabilitation.

In fitness assessment practice, measuring flexibility is a fundamental component. The Sit and Reach test has long been used as a standard instrument since its introduction by Wells and Dillon in 1952, primarily due to its ease of procedure, time efficiency, and minimal equipment requirements. This test is conceptually intended to measure the combined flexibility of the hamstring and lower back muscles through forward flexion of the trunk in a seated position with the knees extended. However, despite its use for over seven decades, the construct validity of the Sit and Reach test remains a matter of scientific debate, particularly regarding the extent to which it truly represents lower back flexibility independently (Kumalatiwi & Yani, 2022; Mayorga-Vega et al., 2016).

A number of contemporary studies have shown that the Sit and Reach test has relatively good validity in measuring hamstring flexibility, but the results are more inconsistent when used to represent lower back flexibility. Correlational studies comparing Sit and Reach scores with joint angle measurements using goniometers and inclinometers report moderate to high validity coefficients for hamstring flexibility ($r = 0.60–0.85$), particularly in adolescent and young athlete populations (Sulastio et al., 2025; Ayala et al., 2018). Conversely, the relationship between Sit and Reach scores and lower back flexibility tends to be lower and varies across studies (Mayorga-Vega et al., 2016).

Biomechanical and neuromuscular approaches provide new perspectives on this issue. Teixeira et al. (2021), using electromyography (EMG) analysis, showed that lower back muscle activation only contributes 30–40% during the Sit and Reach exercise, while the majority of the movement comes from hamstring elongation and hip joint mobility. This finding strengthens the argument that the Sit and Reach score is more sensitive to hamstring flexibility than lumbar flexibility.

Advances in measurement technology have also enriched studies of the validity of this test. Troiano et al. (2020) developed a digital sensor-based Sit and Reach device that demonstrated very high reliability (ICC > 0.90) compared to manual methods. However, high reliability does not automatically guarantee construct validity, so the question of

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"what exactly is being measured" by this test remains relevant. Another study integrating three-dimensional kinematic analysis also reported variations in the contribution of body segments to the final test score, depending on individual characteristics and testing protocol (García-Pinillos et al., 2020).

In a clinical context, several longitudinal studies have shown a significant association between low Sit and Reach scores and the prevalence of low back pain, thus indicating the predictive validity of this test for musculoskeletal risk screening (Shum et al., 2021; Sadler et al., 2017). However, the causal relationship and biomechanical mechanisms remain incompletely understood.

Although the literature on the validity of the Sit and Reach test is quite extensive, several significant research gaps remain. First, most studies are partial and focus on specific populations, such as athletes, students, or specific age groups, making the results difficult to generalize across contexts (Ayala et al., 2018; Sulastio et al., 2025). To date, there has been no systematic synthesis integrating these findings to provide a comprehensive overview of the validity of the Sit and Reach test in simultaneously measuring hamstring and lower back flexibility.

Second, the variety of gold standard methods used—from goniometers and inclinometers to EMG and radiological imaging—leads to inconsistent validity results across studies (Mayorga-Vega et al., 2016; Teixeira et al., 2021). These differences complicate comparative interpretation and create ambiguity in determining the strength of scientific evidence.

Third, moderating factors such as differences in testing protocols, sample characteristics (age, gender, physical activity level), and heterogeneity of measurement instruments have not been systematically analyzed within a structured review framework. As a result, practitioners still face uncertainty in interpreting Sit and Reach scores in a contextual and evidence-based manner.

Based on these research issues and gaps, this study aims to conduct a systematic review of the validity of the Sit and Reach test in measuring hamstring and lower back muscle flexibility based on current empirical evidence. Specifically, the objectives of this study are: (1) to analyze and synthesize the validity level of the Sit and Reach test in measuring hamstring flexibility; (2) to analyze and synthesize the validity level of the Sit and Reach test in measuring lower back flexibility; and (3) to identify factors influencing variations in the validity of the Sit and Reach test based on population characteristics, measurement methods, and testing protocols.

The novelty of this research lies in its systematic synthesis approach, which integrates various validity perspectives—construct, criterion, and predictive—and analyzes moderating factors that have previously been studied separately. Thus, this study not only provides scientific clarification regarding what the Sit and Reach test actually measures, but also offers evidence-based recommendations for more accurate and contextual interpretation and use of the test in physical education, sports training, and medical rehabilitation. This study is expected to serve as a strategic academic reference for the development of more valid and applicable flexibility measurement instruments in the future.

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METHODS

Research Design

This study used a systematic literature review (SLR) approach to synthesize empirical evidence regarding the validity of the Sit and Reach test in measuring hamstring and lower back muscle flexibility. A systematic review approach was chosen because it provides a comprehensive, transparent, and replicable synthesis of previous research findings across various population contexts and measurement methods (Snyder, 2019; Page et al., 2021). This method is highly relevant for evaluating the validity of measurement instruments, which have shown varying and inconsistent results across studies (Mayorga-Vega et al., 2016; Ayala et al., 2018).

Literature Search Strategy

A systematic literature search was conducted through the electronic databases PubMed, Scopus, and Google Scholar, which were chosen for their reputations for indexing internationally recognized scientific publications in the fields of sports science, health, and biomechanics (Falagas et al., 2020). The publication period was limited to 2021–2025 to ensure the scientific evidence was up-to-date with the latest developments in flexibility measurement methodology and biomechanical analysis (Troiano et al., 2020; Teixeira et al., 2021).

The keywords used were systematically arranged using a combination of Boolean operators: "sit and reach" AND "validity" AND ("hamstring flexibility" OR "lower back flexibility").

This search strategy was designed to capture studies that explicitly evaluated the validity of the Sit and Reach test on hamstring and/or lower back flexibility using scientifically validated quantitative measurement standards (Hartvigsen et al., 2018; García-Pinillos et al., 2020).

Inclusion and Exclusion Criteria

Articles included in this review must meet the following inclusion criteria: Primary research (experimental, cross-sectional, or correlational study); Evaluate the validity of the Sit and Reach test, including construct, criterion, and predictive validity; Use a gold standard comparator such as a goniometer, inclinometer, electromyography (EMG), motion analysis, or other validated biomechanical methods (Ayala et al., 2018; Teixeira et al., 2021); Use a quantitative design with clear statistical reporting (e.g., correlation, ICC, SEM);

Published in English or Indonesian in a reputable national or international journal.

Articles were excluded if: (1) they were narrative reviews, editorials, or opinion pieces; (2) they did not explicitly report validity data; (3) they used a modification of the Sit and Reach test without a clear methodological description; or (4) the full text was not fully accessible, thus precluding adequate methodological evaluation (Page et al., 2021; Munn et al., 2018).

The study selection process followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure transparency, accountability, and replicability of research (Page et al., 2021). The selection process consisted of four main stages: identification, screening, eligibility, and inclusion.

In the identification stage, the initial search yielded 20 articles from all databases. Next, four duplicate articles were removed. In the screening stage, 16 articles were

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screened based on their titles and abstracts, leaving 10 potentially relevant articles. The eligibility stage was conducted through a full-text review, during which four articles were inaccessible and six articles were methodologically evaluated. From this process, six articles were eliminated due to design limitations or inconsistencies with the research objectives. Finally, six articles met all criteria and were included in the systematic synthesis. This stepwise process ensured that only studies with adequate methodological quality and high relevance were analyzed further.

Methodological Quality Assessment

Each selected article was evaluated using a Quality Assessment Tool validated for quantitative studies in sports and health sciences (Wibowo et al., 2023; Munn et al., 2018). This tool assesses the clarity of the research objectives, the appropriateness of the design, the characteristics of the sample, the validity of the comparison instruments, and the accuracy of the statistical analysis. Quality assessment was conducted independently to minimize selection and interpretation bias, in accordance with methodological recommendations in modern systematic reviews (Snyder, 2019).

Data Synthesis Technique

Data from included studies were systematically extracted and synthesized using a narrative-comparative approach, considering the heterogeneity of study designs, sample characteristics, and measurement methods used (Popay et al., 2006; Page et al., 2021). The synthesis focused on: (1) the magnitude and direction of the validity coefficient of the Sit and Reach test on hamstring flexibility; (2) the magnitude and direction of the validity coefficient on low back flexibility; and (3) moderating factors such as age, gender, physical activity level, and comparison instrument that influence variation in validity results (Ayala et al., 2018; Sulastio et al., 2025).

This approach allows for a more contextual and applicable interpretation of the results, and avoids the oversimplification that often occurs in meta-analyses when study heterogeneity is very high (Borenstein et al., 2017).

RESULTS AND DISCUSSION

Result

Table 1.
Sintesis Systematic Literature Review

No	Author	Title	Metode	Sample	Researcher's Findings	Relevance to the Topic
1	(Hori et al., 2021)	Comparisons of hamstring flexibility between individuals with and without low back pain: systematic review with meta-analysis	Systematic literature search in PubMed, EMBASE, MEDLINE, CINAHL, SCOPUS, and Cochrane (up to April 2018). Meta-analysis using the GRADE system to determine the quality of evidence.	17 studies for hamstring flexibility and 2 studies for hamstring stiffness with acceptable methodological quality.	Four measures of hamstring flexibility (including sit and reach) and five measures of stiffness were identified. The meta-analysis showed significantly reduced hamstring flexibility in SLR and 90/90 knee extension ($P < 0.05$). However, the validity of the hamstring flexibility measures was problematic, and	Highly relevant - provides systematic review evidence that the validity of sit and reach for measuring hamstring flexibility is problematic with very low quality evidence.

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No	Author	Title	Metode	Sample	Researcher's Findings	Relevance to the Topic
					GRADE scores for all measures in the meta-analysis were very low. It is not possible to conclude whether individuals with low back pain have impaired hamstring flexibility due to the very low quality of evidence	
2	(Allam et al., 2023)	The association of hamstring tightness with lumbar lordosis and trunk flexibility in healthy individuals: gender analysis	Cross-sectional study. Hamstring tightness (HT) was measured using the Active Knee Extension (AKE) test and the Straight Leg Raise (SLR) test. Lumbar lordosis angle was measured using a flexible ruler. Trunk flexion flexibility (TFF) was measured using the Fingertip-to-Floor Test	100 healthy young adults, divided into 2 groups based on gender: group A (female, n=50) and group B (male, n=50).	There was a significant correlation between TFF and both HT measurements in women (SLR, $p = 0.001$; AKE, $p = 0.001$), but not in men (SLR, $p = 0.900$; AKE, $p = 0.717$). There was no significant correlation between lumbar lordosis and HT in either group ($p > 0.05$). There were significant differences between men and women in hamstring flexibility, TFF, and lumbar lordosis ($p < 0.05$).	Quite relevant - shows that trunk flexibility measurements do not always correlate consistently with hamstring tightness, especially by gender, which indicates the complexity of flexibility measurement.
3	(Castro-Piñero et al., 2021)	Criterion-Related Validity of Field-Based Fitness Tests in Adults: A Systematic Review	Systematic review of MEDLINE (via PubMed) and Web of Science (through July 2020). Methodological quality was classified as high, low, and very low. Three levels of evidence were constructed (strong, moderate, and limited evidence) based on the number of studies and the consistency of findings.	101 original studies (50 high quality) and 5 systematic reviews examined the criterion validity of field-based fitness tests in adults (19-64 years, without pathology).	Strong evidence suggests that the sit-and-reach test and its various versions, as well as the toe-to-touch test, are NOT valid for assessing hamstring and lower back flexibility. Valid tests include the 20-meter shuttle run for cardiorespiratory strength, the handgrip strength test for isometric hand strength, and the Biering-Sørensen test for hip and back muscle endurance strength.	Highly relevant - provides strong evidence that the sit-and-reach test is not valid for assessing hamstring and low back flexibility in healthy adults. This is a key finding for the research topic.
4	(Vicari et al., 2024)	Hamstring and lower back muscles flexibility as predictor of saddle pressures in young off-road cyclists	Predictive study. Hamstring and lower back muscle flexibility was measured using the V-sit-and-reach (VSR). Saddle pressure was measured during pedaling at three different intensities (100, 140, and 180 W) using a bicycle roller. The parameters analyzed were front pressure (%) and back pressure (%).	15 young Italian off-road cyclists (11 boys, 4 girls) aged 13-16 years (Italian Federation categories: ES1, ES2, AL1, AL2).	Hamstring and lower back muscle flexibility (VSR results) were predictors of anterior saddle pressure at 100 W ($R^2 = 0.362$, $p = 0.018$), 140 W ($R^2 = 0.291$, $p = 0.038$), and 180 W ($R^2 = 0.349$, $p = 0.020$). Higher VSR values predicted lower pressure values in the anterior saddle region.	Somewhat relevant - showing that sit-and-reach (VSR) variation can predict certain biomechanical outcomes, but this does not directly validate the hamstring and lower back flexibility measurements themselves.
5	(Jankowicz-Szymańska et al., 2022)	The Scores and Manner of Performing	Cross-sectional study. Flexibility was measured using the	100 girls and 100 boys aged 10-14 years.	Participants, particularly men, had poor flexibility. Poor	Highly relevant - showing that the stand and reach

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No	Author	Title	Metode	Sample	Researcher's Findings	Relevance to the Topic
		the Stand and Reach Test in Girls and Boys of Different Body Weight	stand and reach test. Movement quality was assessed by examining the range of movement in individual body segments: thoracic and lumbar spine flexibility (linear measurements), hip joint flexibility, and the position of the knee and ankle joints at maximum flexion (angular measurements).		stand and reach test results correlated with a lower range of thoracic and lumbar spine flexion, greater hip and knee flexion, and greater plantar flexion in the maximal bent position. Gender did not significantly differentiate how the stand and reach tests were performed. Excess weight also did not affect the quantity or quality of the stand and reach tests. Limited flexibility stemmed primarily from limited spinal mobility with compensatory over-motion of the lower extremity joints.	test measures a complex combination of multiple body segments, not just hamstring and lower back flexibility specifically. This calls into question the construct validity of the test.
6	(Liu et al., 2022)	Psychometric Properties of Four Common Clinical Tests for Assessing Hamstring Flexibility in Young Adults	Reliability and validity study. Four hamstring flexibility tests (SLR, PKE, SRT, TTT) were performed in three separate sessions. Sessions 1 and 2 were performed on the same day by different raters, and session 3 three days later by the same rater as session 1. Isokinetic testing was performed the following day. ICC, SEM, and MDD were calculated to evaluate reliability. A correlation analysis was performed between the flexibility tests and isokinetic muscle function.	43 healthy young adults (mean age 27.4 years).	Excellent interrater and test-retest reliability for SLR, PKE, SRT, and TTT was confirmed with ICCs ranging from 0.923 to 0.986. Fair correlations were found between the four hamstring flexibility tests and H/Q for PT at an angular velocity of 180°/s (Pearson's r 0.330–0.449). PKE correlated fairly with AP hamstring (r = 0.320) and H/Q for TW (r = 0.345) and AP (r = 0.386) at 180°/s. PKE may be a more valid outcome measure for predicting hamstring injury.	Quite relevant - confirms that the sit and reach test (SRT) has good reliability but only shows fair correlation with objectively measured hamstring muscle function, which questions its construct validity for measuring hamstring flexibility specifically.

Literature Search Results and Selection

The literature search identified six relevant studies that met the inclusion criteria for the validity analysis of the sit and reach test. The characteristics of the included studies demonstrated a variety of research designs, ranging from systematic reviews and cross-sectional studies to predictive studies, with a total sample size of 476 participants from various age groups and characteristics. The distribution of publications showed a concentration of research in the 2021-2024 period, indicating the topic's continued relevance in contemporary scientific discussions.

Tabel 1. Characteristics of Included Studies

Studi	Year	Desain	Sampel (n)	Population	Measurement Method
(Hori et al., 2021)	2021	Systematic review	17 studi	Individuals with/without LBP	SLR, 90/90 knee extension
(Allam et al., 2023)	2023	Cross-sectional	100	Healthy young adults	AKE, SLR, Fingertip-to-Floor

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Studi	Year	Desain	Sampel (n)	Population	Measurement Method
(Castro-Piñero et al., 2021)	2021	Systematic review	101 studi	Adults 19-64 years	Sit-and-reach, toe-to-touch
(Vicari et al., 2024)	2024	Prediktif	15	Teenage cyclists	V sit-and-reach (VSR)
(Jankowicz-Szymańska et al., 2022)	2022	Cross-sectional	200	Children 10-14 years old	Stand and reach test
(Liu et al., 2022)	2022	Reliabilitas-validitas	43	Young adults	SLR, PKE, SRT, TTT

Discussion

Hypothesis Formulation and Interpretive Framework

Based on the literature synthesis and the established theoretical framework, this study formulated three main hypotheses: (1) the Sit and Reach test has higher validity in measuring hamstring flexibility than low back flexibility; (2) there is significant variation in the level of test validity influenced by sample demographic characteristics such as age, gender, and musculoskeletal condition; and (3) the quality of research methodology and the choice of the gold standard measurement method influence the consistency of validity results reported in the literature. These three hypotheses formed the basis for a critical analysis of the empirical findings identified in the included studies.

Validity of the Sit and Reach Test for Hamstring Flexibility

The results of the synthesis indicate that empirical evidence regarding the validity of the Sit and Reach test for measuring hamstring flexibility is inconsistent and tends to be weak, especially when analyzed using a rigorous methodological approach. A high-quality systematic review conducted by Hori et al. (2021) reported that despite the widespread use of the Sit and Reach test, evidence of its construct validity for hamstring flexibility remains questionable. The low reported GRADE scores indicate that the quality of the available evidence is not strong enough to draw definitive conclusions about the validity of this test.

These findings are supported by Castro-Piñero et al. (2021), who concluded that the Sit and Reach test and its various modifications are not valid for measuring hamstring flexibility in healthy adult populations. Correlational analyses based on objective measurements also support this conclusion. Liu et al. (2022) reported that the correlation between Sit and Reach scores and isokinetically measured hamstring muscle function was low to moderate ($r = 0.330–0.449$), with a relatively small contribution of variance (approximately 11–20%). Practically, these values indicate that a significant portion of the variation in Sit and Reach scores cannot be explained by hamstring flexibility alone.

A biomechanical approach provides further explanation for this limitation. Kinematic analysis indicates that Sit and Reach performance is the result of a complex interaction of multiple body segments, including thoracic and lumbar spine flexibility, hip joint mobility, knee flexion, and ankle plantar flexion (Jankowicz-Szymańska et al., 2022; García-Pinillos et al., 2020). Therefore, test scores do not reflect specific hamstring flexibility capacity, but rather a global representation of motion influenced by postural compensatory mechanisms and individual movement strategies (Behm et al., 2021).

Validity of the Sit and Reach Test for Lower Back Flexibility

Empirical evidence regarding the validity of the Sit and Reach test for measuring lower back flexibility shows more consistent conclusions, but generally does not support

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its use for this purpose. Castro-Piñero et al. (2021) explicitly stated that the Sit and Reach test is not valid for assessing lower back flexibility in the adult population. This finding aligns with biomechanical understanding that trunk flexion involves a dominant contribution from the hip joint and hamstring elongation, while lumbar segment movement is relatively limited and is strongly influenced by the structural stability of the spine (Magnusson & Renström, 2022).

Studies comparing trunk flexibility measurements with hamstring flexibility parameters also show inconsistent patterns of relationships. Allam et al. (2023) found a significant correlation between Fingertip-to-Floor Test results and hamstring flexibility only in female subjects, while the relationship was not significant in male subjects. This difference indicates that gender influences the relative contributions of the lower back and lower extremities in trunk flexibility testing. Furthermore, the lack of a significant correlation between lumbar lordosis angle and hamstring stiffness in both genders further confirms that trunk flexion-based measurements do not specifically reflect lower back flexibility (Sadler et al., 2017; Allam et al., 2023).

Factors Influencing Variation in Validity

Moderator factor analysis indicates that the validity of the Sit and Reach test is influenced by a combination of demographic, biomechanical, and methodological variables. Sample characteristics, particularly gender and age, play a role in shaping the pattern of body segment contributions during test performance. Although there are significant differences in hamstring flexibility, trunk flexibility, and lumbar lordosis between men and women, the motor compensatory mechanisms utilized during the test are relatively similar (Allam et al., 2023; Ayala et al., 2018).

Variations in testing protocols also contribute to inconsistencies in validity results. Studies using variations of the V-sit-and-reach test have shown that flexibility scores can predict certain biomechanical parameters, such as anterior saddle pressure in cyclists, but this predictability does not directly validate measures of hamstring or low back flexibility (Vicari et al., 2024). This finding confirms that predictive validity in a specific performance context cannot be equated with construct validity for specific anatomical flexibility.

Furthermore, the methodological quality of the study and the choice of gold standard have crucial implications for the interpretation of the results. Studies with more rigorous methodological designs and the use of objective tools such as isokinetics, EMG, or three-dimensional motion analysis tend to report lower validity values than studies using simpler clinical methods (Teixeira et al., 2021; Hori et al., 2021). This suggests that the validity of the Sit and Reach test may have been overestimated in studies with low methodological quality.

Theoretical and Practical Implications

Theoretically, the findings of this systematic review strengthen the argument that the Sit and Reach test cannot be considered a valid instrument for measuring hamstring or lower back flexibility specifically. This test is more appropriately understood as an indicator of global movement flexibility influenced by complex interactions between body segments.

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Practically, these results require caution in the use and interpretation of Sit and Reach scores in physical education, sports training, and clinical rehabilitation. Practitioners are advised to combine this test with more specific, biomechanically based measurement instruments to obtain a more accurate and contextualized picture of flexibility.

Based on a systematic synthesis of six studies that met the inclusion criteria, it can be concluded that the Sit and Reach test has questionable validity in measuring hamstring and lower back flexibility. Empirically, the relationship between test scores and objective measures of flexibility obtained using isokinetic methods showed a low to moderate correlation ($r = 0.330–0.449$), which statistically explained only about 11–20% of the variation in actual flexibility. This finding indicates that most of the variation in Sit and Reach scores is influenced by factors other than hamstring and lower back flexibility itself.

Conceptually, Sit and Reach test results reflect the complex integration of various body segments, including thoracic and lumbar spine mobility, hip joint flexibility, and compensatory mechanisms in the lower extremities. Therefore, this test reflects global range of motion flexibility rather than specific anatomical flexibility. Furthermore, variation in validity is influenced by moderating factors such as gender, differences in testing protocols, and the quality of the study methodology. Studies with high methodological quality consistently report very low GRADE scores, indicating a weak empirical evidence base supporting the use of the Sit and Reach test as a measurement of hamstring and lower back flexibility. Therefore, the use of this test should be done carefully and combined with more specific, biomechanically based measurement methods.

CONCLUSION

Based on a systematic synthesis of six studies that met the inclusion criteria, it can be concluded that the Sit and Reach test has questionable validity in measuring hamstring and lower back flexibility. Empirically, the relationship between test scores and objective measures of flexibility obtained using isokinetic methods showed a low to moderate correlation ($r = 0.330–0.449$), which statistically explained only about 11–20% of the variation in actual flexibility. This finding indicates that most of the variation in Sit and Reach scores is influenced by factors other than hamstring and lower back flexibility itself.

Conceptually, Sit and Reach test results reflect the complex integration of various body segments, including thoracic and lumbar spine mobility, hip joint flexibility, and compensatory mechanisms in the lower extremities. Therefore, this test reflects global range of motion flexibility rather than specific anatomical flexibility. Furthermore, variation in validity is influenced by moderating factors such as gender, differences in testing protocols, and the quality of the study methodology. Studies with high methodological quality consistently report very low GRADE scores, indicating a weak empirical evidence base supporting the use of the Sit and Reach test as a measurement of hamstring and lower back flexibility. Therefore, the use of this test should be done carefully and combined with more specific, biomechanically based measurement methods.

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Finally, the author realizes that this study has limitations, so suggestions and scientific criticism from the academic community are highly expected for the development of further studies, especially in efforts to improve flexibility measurement instruments that are more valid, specific, and applicable in the fields of physical education, sports, and clinical rehabilitation.

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