DOI: 10.1590/1809-2950/e22017823en



REVIEW ARTICLE

# Body posture self-assessment tools: a scoping review

*Instrumentos de autoavaliação da postura corporal: uma revisão de escopo*

*Instrumentos de autoevaluación de la postura corporal: una revisión de alcance*

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**ABSTRACT |** Postural therapies use active treatment methods, such as self-correction, to control body segments. The evidence for this practice is established from the comparison of the self-perception of body posture before, during, and after postural education. A scoping review of tools to assess self-perception of body posture, besides encouraging research, may guide professionals while developing treatments. This scoping review aims to identify the existing tools that assess self-perception of body posture, describing their type, measurement properties (validity and reliability), and postural outcomes. The protocol of this review was registered in the Open Science Framework (OSF), DOI: 10.17605/OSF.IO/JGH8U. Studies developing and/or evaluating measurement properties and other study designs using self-perception of static body posture as an assessment method were included. In total, 359 studies were found, of which six were analyzed in this study. They presented two types of tool and their measurement properties were related to validity (n=6) and reliability (n=5). Five studies performed the joint analysis of validity and reliability (83%). Spine position, leg and foot posture, trunk and rib deformity, and postural awareness in general were the assessed postural outcomes. Of the six tools that assess self-perception of body posture, only the SSFS scale can be used in any population. To date, no study found a tool that assesses self-perception of body posture and considers all body segments.

Keywords | Self-Perception; Posture; Reproducibility of Tests.

**RESUMO |** As terapias posturais utilizam métodos de tratamento ativo, como a autocorreção, para o alinhamento dos seguimentos corporais. É a partir da comparação da autopercepção da postura corporal antes, durante e após o trabalho em educação postural que as evidências dessa prática serão estabelecidas. Uma revisão de escopo sobre os instrumentos de avaliação da autopercepção da postura corporal, além de fomentar pesquisas, poderá guiar os profissionais nas condutas terapêuticas. O objetivo desta revisão de escopo é identificar quais são os instrumentos existentes que avaliam a autopercepção da postura corporal, descrevendo o tipo de instrumento, suas propriedades de medição (validade e confiabilidade) e os desfechos posturais. O protocolo desta revisão foi registrado no *Open Science Framework* (OSF), doi: 10.17605/OSF.IO/JGH8U. Foram incluídos estudos de desenvolvimento e/ou de avaliação de propriedades de medição e outros desenhos de estudo que utilizaram a autopercepção corporal estática como método de avaliação. Foram identificados 359 estudos, sendo seis deles incluídos neste estudo. Estes apresentaram dois tipos de instrumentos. As propriedades de medição foram relativas à validade (n=6) e à confiabilidade (n=5). A análise conjunta de validade e confiabilidade foi realizada por cinco estudos (83%). Os desfechos posturais avaliados foram: posição da coluna vertebral; postura das pernas e dos pés; deformidade do tronco e das costelas; e consciência da postura em geral. Foram identificados seis instrumentos que avaliam a autopercepção da postura corporal, mas apenas a escala SSFS pode ser usada em qualquer população. Até o momento, não foi identificado nenhum instrumento que avalie a autopercepção da postura corporal e que considere todos os segmentos corporais na análise.

Descritores | Autopercepção; Postura; Reprodutibilidade dos Testes.

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**RESUMEN |** Las terapias posturales utilizan métodos de tratamiento activo, como la autocorrección, para alinear los segmentos del cuerpo. La autopercepción de la postura corporal comparada antes, durante y después del trabajo en educación postural permitirá establecer la evidencia de esta práctica. Una revisión de alcance de los instrumentos que evalúan la autopercepción de la postura corporal, además de incentivar los estudios, puede orientar a los profesionales en las prácticas terapéuticas. El objetivo de esta revisión de alcance es identificar los instrumentos existentes que evalúan la autopercepción de la postura corporal, con la descripción del tipo de instrumento, sus propiedades de medición (validez y confiabilidad) y los resultados posturales. El protocolo para esta revisión está registrado en *Open Science Framework* (OSF), doi: 10.17605/OSF.IO/JGH8U. Se incluyeron estudios de desarrollo y/o evaluación de propiedades de medición u otros tipos de estudio que utilizaron la autopercepción corporal estática como método de evaluación. Se identificaron un total de 359 estudios, de los cuales seis se incluyeron en esta investigación. Estos presentaron dos tipos de instrumentos. Las propiedades de medición se relacionaron con la validez (n=6) y la confiabilidad (n=5). El análisis conjunto de validez y confiabilidad fue realizado por cinco estudios (83%). Los resultados posturales evaluados fueron: posición de la columna; postura de piernas y pies; deformidad del tronco y las costillas; y conciencia de la postura en general. Se identificaron seis instrumentos que evalúan la autopercepción de la postura corporal, pero solamente la escala SSFS puede ser utilizada en cualquier población. Hasta el momento, no se identificó ningún instrumento que evalúe la autopercepción de la postura corporal y que considere todos los segmentos corporales en el análisis.
**Palabras clave |** Autopercepción; Postura; Reproducibilidad de los Resultados.

## INTRODUCTION

Posture is the set of attitudes and body positioning that individuals adopt in their daily life[1]. The constant search for the balance of segments by proper body alignment avoids asymmetric overloads on joint structures[2]. Proper body alignment reduces energy expenditure during movements and prevents discomfort from musculoskeletal dysfunctions from interfering with quality of life[3].

Postural therapies generally use active treatment methods to correct spinal deformities and misaligned body segments or prevent bad posture[4-6]. In these therapies, individuals perform active movements to correct their own posture[4]. For an effective self-correction, they must be able to perceive their own body by themselves, becoming aware of their bodily changes[7]. Thus, the self-perception of body posture is important for both the individual and the physical therapist conducting the treatment.

The ability of humans to seek sensations from the external environment is physiological, thus, by unconsciously combining the multiple sensory signals, they can create a representation of their own body in the mind[8]. Besides postural therapies, health education also constitutes a pillar of body self-perception training, since acquiring theoretical knowledge about posture can stimulate the interest of individuals in perceiving themselves[5]. Understanding the importance of assessing self-perception of body posture and due to the lack of reliable assessment tools, some professionals rely on their own observations and patients' self-report, which are non-standard procedures[9]. Self-reports are one of the most criticized tools in the scientific environment. Their limitations result from the difficulty of reasoning the results, since they are subjective assessment tools. Finding tools that comply with validation procedures, providing adequate and understandable language to patients, in order to lead them to the assessed construct[10]—in the case of this study, self-perception of body posture—is a way to control the reliability of self-reporting.

Thus, this scoping review aims to identify the existing tools that assess self-perception of body posture, describing their type, measurement properties (validity and reliability), if any, and postural outcomes. This review may support the development of future tools to assess self-perception of body posture, applicable in different contexts. Moreover, it can be a useful guide for physical therapists when assessing their patients' self-perception of body posture before, during, and after interventions, helping in clinical decision-making during treatments.

## METHODOLOGY

This scoping review has its protocol registered in the Open Science Framework (OSF), DOI: 10.17605/OSF.IO/JGH8U, and follows the guidelines of the Joanna Briggs Institute (JBI)[11] Manual for Evidence Synthesis,

for the development stages, and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR), for the literary production of scoping reviews[12]. The *population* is nonspecific; the *concept* is the assessment of self-perception of body posture and measurement properties (validity and reliability); and the *context* is self-report tools. Studies developing and/or evaluating measurement properties and other study designs that used self-perception of body posture as an assessment method were included. Tools that assess self-perception of dynamic posture (during daily and work activities) and tools that require professional assessment were not accepted. No date or language restrictions were established.

The search was conducted in April 2022 on the PubMed, Embase, and Scopus databases. Figure 1 shows the keywords used in PubMed and Figure 2, the keywords used in Scopus and Embase. In other databases, the search was performed with the same keywords, adapted to each one.

| | |
|---|---|
| #1 | Posture [MeSH] OR posture OR postures |
| #2 | Perception [MeSH] OR Perception OR "Sensory Processing" OR "Processing, Sensory" OR "Self Report" [MeSH] OR "Self Report" OR "Report, Self" OR "Reports, Self" OR "Self Reports" OR "Self-assessment" [MeSH] OR "Self-assessment" OR "Self-Assessments" OR "Self Assessment" OR "Assessment, Self" OR "Assessments, Self" OR "Self Assessments" OR "Self-evaluation" |
| #3 | "Reproducibility of Results" [MeSH] OR "Reproducibility of Results" OR "Reproducibility of Findings" OR "Reproducibility Of Result" OR "Of Result, Reproducibility" OR "Of Results, Reproducibility" OR "Result, Reproducibility Of" OR "Results, Reproducibility Of" OR "Reproducibility of Finding" OR "Finding Reproducibility" OR "Reliability of Results" OR "Reliability of Result" OR "Result Reliability" OR "Reliability (Epidemiology)" OR "Validity (Epidemiology)" OR "Validity of Results" OR "Validity of Result" OR "Result Validity" OR "Face Validity" OR "Validity, Face" OR "Reliability and Validity" OR "Validity and Reliability" OR "Test-Retest Reliability" OR "Reliabilities, Test-Retest" OR "Reliability, Test-Retest" OR "Test Retest Reliability" OR "Validation Studies" |
| #4 | "Questionnaires and Surveys" [MeSH] OR "Questionnaires and Surveys" OR "Survey Methods" OR "Methods, Survey" OR "Survey Method" OR "Methodology, Survey" OR "Survey Methodology" OR "Community Surveys" OR "Community Survey" OR "Survey, Community" OR "Surveys, Community" OR "Repeated Rounds of Survey" OR "Surveys" OR "Survey" OR "Questionnaire Design" OR "Design, Questionnaire" OR "Designs, Questionnaire" OR "Questionnaire Designs" OR "Baseline Survey" OR "Baseline Surveys" OR "Survey, Baseline" OR "Surveys, Baseline" OR "Respondents" OR "Respondent" OR "Questionnaires" OR "Questionnaire" OR "Nonrespondents" OR "Nonrespondent" |

#1 AND #2 AND #3 AND #4 AND

Figure 1. Keywords used in the PubMed database

| | |
|---|---|
| #1 | Posture OR postures |
| #2 | Perception OR "Sensory Processing" OR "Processing, Sensory" OR "Self Report" OR "Report, Self" OR "Reports, Self" OR "Self Reports" OR "Self-assessment" OR "Self-Assessments" OR "Self Assessment" OR "Assessment, Self" OR "Assessments, Self" OR "Self Assessments" OR "Self-evaluation" |
| #3 | "Reproducibility of Results" OR "Reproducibility of Findings" OR "Reproducibility Of Result" OR "Of Result, Reproducibility" OR "Of Results, Reproducibility" OR "Result, Reproducibility Of" OR "Results, Reproducibility Of" OR "Reproducibility of Finding" OR "Finding Reproducibility" OR "Reliability of Results" OR "Reliability of Result" OR "Result Reliability" OR "Reliability" OR "Validity" OR "Validity of Results" OR "Validity of Result" OR "Result Validity" OR "Face Validity" OR "Validity, Face" OR "Reliability and Validity" OR "Validity and Reliability" OR "Test-Retest Reliability" OR "Reliabilities, Test-Retest" OR "Reliability, Test-Retest" OR "Test Retest Reliability" OR "Validation Studies" |
| #4 | "Questionnaires and Surveys" OR "Survey Methods" OR "Methods, Survey" OR "Survey Method" OR "Methodology, Survey" OR "Survey Methodology" OR "Community Surveys" OR "Community Survey" OR "Survey, Community" OR "Surveys, Community" OR "Repeated Rounds of Survey" OR "Surveys" OR "Survey" OR "Questionnaire Design" OR "Design, Questionnaire" OR "Designs, Questionnaire" OR "Questionnaire Designs" OR "Baseline Survey" OR "Baseline Surveys" OR "Survey, Baseline" OR "Surveys, Baseline" OR "Respondents" OR "Respondent" OR "Questionnaires" OR "Questionnaire" OR "Nonrespondents" OR "Nonrespondent" |

#1 AND #2 AND #3 AND #4 AND

Figure 2. Keywords used in the Scopus and Embase databases

Studies were imported into the Rayyan platform, where the duplicates were removed. Two reviewers (MGS and BMP) read the titles and abstracts in an independent and blinded manner to evaluate the inclusion of each article. In cases of disagreement, a third evaluator was requested. The peer review was completed after both reviewers had read the full text of each study included. Disagreements were resolved in a meeting, seeking consensus. In case of lack of consensus, a third reviewer decided on the inclusion or exclusion of articles.

Data on authorship, year of publication, country of origin, tool name, type of tool, postural outcome (or assessed body segment), tool domains (assessed aspects associated with body perception), and its measurement properties,

if any, were extracted by a single reviewer using a form prepared by the research team. For the postural outcome, no previous criteria were established, thus, any outcome presented by each included article was accepted.

After data extraction, the identified tools were grouped according to the assessed outcome. Measurement properties were analyzed according to the Consensus-Based Standards for the Selection of Health Status Measurement Instruments (COSMIN)[13], thus, validity properties were classified as: (1) concurrent validity, which refers to the agreement of results between the proposed tool and another tool of already recognized validity; (2) structural validity, which is the degree that shows whether the scores of a tool adequately reflect the dimension of the assessed construct; (3) content validity, which is both the qualitative and quantitative assessment of the clarity and applicability of the tool, conducted by a committee of experts; (4) construct validity, which shows whether the test is sensitive for differences between distinct knowledge groups; (5) convergent validity, which is the degree of agreement that exists between at least two measures with different methods for each construct; and (6) discriminant validity, which is the degree to which these measures differ from each other. Reliability, the absence of measurement errors, was assessed considering the following properties: (1) intra-rater reproducibility, which is the maintenance of measurements in different evaluations by the same evaluator; (2) inter-rater reproducibility, which refers to the lack of variation in measurements of the same individual by different evaluators; (3) test-retest reproducibility, which is the result of a set of items of the same individual, reported more than once over time; and (4) internal consistency, which is the degree of interrelationship between items. In this review, no *a priori* criteria were established to analyze each measurement property, therefore, the criteria defined by each study were accepted.

## RESULTS

In total, 359 studies were found: 93 in PubMed, 176 in Embase, and 90 in Scopus. After removing duplicates and articles outside the eligibility criteria, six were included in this scoping review (Figure 3). From them, we identified two types of tools to assess self-perception of body posture: four scales[14-17] and two questionnaires[18,19].

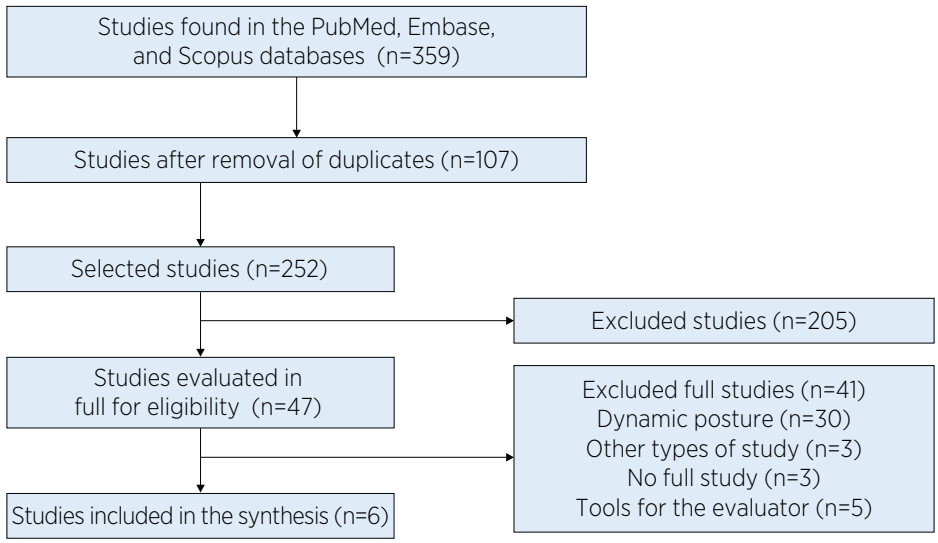


Figure 3. Flowchart of the study selection process, following the recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR)

Table 1 shows the data extracted from the studies. We assessed validity-related measurement properties more often (n=6) than reliability-related properties (n=5). Three studies presented discriminant validity, three convergent validity, two content validity, three construct validity, five internal consistency, one structural validity, and no study presented more than one validity simultaneously. Reliability had a more heterogeneous analysis profile. Only one study analyzed intra- and inter-rater reproducibility and four assessed test-retest reproducibility. No article presented the four reliability properties (intra-rater, inter-rater, test-retest, and accuracy analysis) simultaneously. Five studies performed the joint analysis of validity and reliability (83%).

Table 1. Data extracted from the studies included in the review

| Questionnaire | Authorship (year) | Psychometric properties | Sample and sex | Mean age±SD (years old) | Sample characteristics | Postural outcome (perception) |
|---|---|---|---|---|---|---|
| Lower limb function assessment scale – LL-FAS | Allart et al.[19] (2014) | Reliability (intra- and inter-rater reproducibility)<br>Validity (content, construct, and internal consistency) | n=35 (22 M/13 W) | 59.3±14.6 | Stroke | Standing (perception of back, leg, and foot posture and weight distribution) |
| Self-reported spine functional scale – SSFS | Li et al.[16] (2021) | Reliability (test-retest)<br>Validity (content, structural, and internal consistency) | n=916 (752 M/164 W) | 21.16±8.67 | Healthy young adults | Standing and lying down (perception of the posture of the cervical spine, thoracic spine, and lumbar spine) |
| Trunk appearance perception scale – TAPS | Bago et al.[14] (2010) | Reliability (test-retest)<br>Validity (concurrent, structural, discriminant, convergent, and internal consistency) | n=186 (26 M/160 W) | 33.6±17.0 | Idiopathic scoliosis | Standing and in the Adam's test position (perception of trunk deformity) |
| Walter Reed visual assessment scale – WRVAS | Pineda et al.[15] (2006) | Reliability (test-retest)<br>Validity (concurrent, structural, discriminant, convergent, and internal consistency) | n=70 (10 M/60 W) | 19.4 (12-40) | Idiopathic scoliosis | Standing and in the Adam's test position (perception of spinal and rib deformity, lumbar and thoracic prominence, trunk imbalance, uneven shoulders, and scapular rotation) |
| Spinal appearance questionnaire – SAQ | Sanders et al.[18] (2007) | Reliability (test-retest)<br>Validity (internal consistency) | n=235 | N/A | Idiopathic scoliosis | Standing (perception of the appearance of the spinal deformity) |
| Postural awareness scale – PAS | Cramer et al.[17] (2018) | Reliability (test-retest)<br>Validity (content, construct, and internal consistency) | n=512 (43 M/469 W) | 50.3±11.4 | Patients with chronic pain | Postural awareness |

W: women; M: men; N/A: not available or not informed.

The most recurrent postural outcome in the articles concerned self-perception of spinal position[14-16,18,19]. We also found other outcomes, such as leg and foot posture[19], trunk and rib posture[14,15,18], and postural awareness[17]. Some articles included populations with specific conditions, such as scoliosis[14,15,18] and stroke[19], and used tools that assess the individual's perception regarding the progression of deformities in their body structures. Two other studies[16,19] were broader and involved different domains of self-perception of static posture, assessing self-perception of body posture during daily activities, spinal muscle strength, and body function in certain actions. Table 2 shows the domains and scores of questionnaires and scales.

Table 2. Domains and scores of questionnaires and scales

| Questionnaire (country) | Authorship (year) | Domains | Interpretation and score |
|---|---|---|---|
| Lower limb function assessment scale – LL-FAS (France) | Allart et al.[19] (2014) | 1. Standing upright (9 items)<br>2. While walking (21 items) | Visual analogue scale ranging from 0 ("I can't do this activity at all") to 10 ("I can do this activity without any difficulty"). |
| Self-reported spine functional scale – SSFS (China) | Li et al.[16] (2021) | Postural assessment<br>Assessment of cardiac function | Four-point scale, in which 0: loss of spinal motor function; 1: severe spinal motor dysfunction; 2: mild to moderate spinal motor dysfunction; and 3: good spinal motor function. |
| Trunk appearance perception scale – TAPS (Spain) | Bago et al.[14] (2010) | 1. Trunk deformity | Three questions associated with five images. Each question scores 1 (major change) to 5 (minor change), answers are summed, and the result is divided by 3. |
| Walter Reed visual assessment scale – WRVAS (Spain) | Pineda et al.[15] (2006) | 1. Perception of deformity | Each question scores 1 (best) to 5 (worst). The total score is the sum of the seven questions. |

(continues)

Table 2. Continuation

| Questionnaire (country) | Authorship (year) | Domains | Interpretation and score |
|---|---|---|---|
| Spinal appearance questionnaire – SAQ (United States) | Sanders et al.[18] (2007) | 1. Appearance of spinal deformities | N/A |
| Postural awareness scale – PAS (Germany) | Cramer et al.[17] (2018) | 1. Ease and familiarity with postural awareness<br>2. Need and regulation of attention with postural awareness | Likert scale ranging from 1 (nothing true about me) to 7 (very true about me). |

N/A: not available or not informed.

## DISCUSSION

This scoping review aimed to identify tools that assess self-perception of static body posture, describing its characteristics. The types of tool found were scales and self-report questionnaires, which used images[14,15,18] or descriptive questions[16,17,19] to represent the assessed construct. Most studies tested content validity[16,19] and, similarly, their objectives were broader, combining the perception of static posture with other constructs in order to provide a better functional understanding of the spine[16] and impaired functionality in stroke patients[19]. However, tools that use adequate language, with body images, for example, can help individuals recognize and perceive their body asymmetries[20], which is essential when measuring the effects of any postural therapy[3]. Regarding test-retest reproducibility, tools with images had higher intra-class correlation coefficient (ICC) values, ranging from 0.55 to 0.99[18] and 0.92[14], which classify them as excellent. For tools with textual language (descriptive questions), which are the same with broad objectives, ICC values were divided by each domain. For the SSFS scale[16], ICC was 0.80 for the posture domain, with individual values for each outcome: 0.63 for standing posture and 0.56 for supine posture. The PAS scale[17] also had separate values for each domain. For "ease and familiarity with postural awareness," which the authors defined as the subjective awareness of body posture, relying mainly on proprioceptive feedback from the periphery of the body to the central nervous system[17], ICC was 0.80. For "need and regulation of attention with postural awareness," ICC was 0.81. Regardless of the type of tool, reliability is associated with changes in the self-perception of posture and deformities after specific treatments, as in the case of scoliosis[21].

Posture self-perception tools are not developed to classify postures as "correct" or "incorrect." Usually, the questions are organized by body segments and each answer option present the degrees of development of deformities, ranging from symmetrical posture to more severe asymmetries[15,18,22]. For clinical practice, each answer is crucial when establishing treatments, since it concerns the patients' view of their own posture[15]. The importance of our scoping review lies precisely in this point. Showing the different tools that can be used to assess self-perception of posture encourages physical therapists to also value the patients' perception and not base therapies only on their own observation.

As an example of the importance of self-perception of body posture for clinical practice, we point the treatment of scoliosis, whose main characteristic is the progression of the spine curve[4,23]. Some studies assess the effect of conservative treatment on the development of this curve[21]. In this type of treatment, patients develop the ability to actively correct their own spine and may achieve the best possible alignment of all body parts[24]. The success of the treatment is related to the patients' ability to perceive and know their posture[24]. By becoming aware of their posture, patients will be able to perform corrective movements with mastery and, in their routine, they will know how to maintain healthy postures that do not favor the asymmetries caused by scoliosis.

All studies included in this review had the common limitation of using tools focused on a particular pathology, except for the SSFS scale[16], as the sample of its study involved healthy participants. Moreover, the postural outcomes were restricted to the affected body segment[14,15,18,19]. By assessing only the isolated self-perception of the spine, even SSFS[16] falls short of the needs inherent to the treatment of scoliosis. Moreover, the tools with images did not have answer options for individuals who could not recognize themselves in them,

which would result in the induction of patients in the choice of answers. All studies considered posture only in the musculoskeletal context, thus, they did not address the possibilities of changes in human behavior that are influenced by multifactorial issues and can assume and form a certain posture[20,25]. As a positive aspect, all studies based their results on the metric properties of the proposed tools[13]. Moreover, this scoping review summarizes all posture self-perception tools, serving as a guide for physical therapists in choosing one tool or another.

## CONCLUSION

We found six tools that assess self-perception of body posture and only the self-reported spine functional scale (SSFS) can be applied to any population.

All tools specifically assess restricted postural outcomes, such as trunk deformities or leg and foot dysfunctions.

To date, no study identified a tool that assesses the construct of self-perception of body posture and considers all body segments in the analysis.

All tools analyzed in this review presented validity and reliability, except for the Walter Reed visual assessment scale (WRVAS), which still lacks reliability.

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