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Cultural Contexts Meet Clinical Precision: A Systematic Review and Meta-Analysis of Sarcopenia Screening Tools in Global Aging Communities

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Abstract

In an aging world population, prevention is essential because sarcopenia, a loss of muscular mass and function brought on by aging, significantly raises health risks and healthcare expenses. This PRISMA 2020-compliant systematic review (PROSPERO: CRD42024512949) evaluates the diagnostic performance of sarcopenia screening tools for community-dwelling older adults. We analyzed 27 studies (21,271 older adults) assessing eight tools. Databases were searched until February 20, 2024. While questionnaire-only tools performed worse (AUC: 0.68), tools that combined various approaches exhibited the highest accuracy (AUC: 0.89), and the performance of anthropometric instruments was good (AUC: 0.84). The Ishii tool showed the best performance (AUC: 0.89 [0.85–0.92]), and SARC-F the lowest (AUC: 0.68 [0.62–0.73]). Subgroup analysis revealed more studies and greater heterogeneity in Asia, likely due to cultural, lifestyle, and diagnostic criteria. Culturally adapted, multi-method strategies are needed to improve early detection and care.

Keywords: *Sarcopenia, Screening Tools, Diagnostic Performance, Meta-Analysis.*

Introduction

To highlight the importance of tackling the health issues of aging populations worldwide, the World Health Organization (WHO) declared 2021–2030 the Decade of Healthy Ageing (WHO, 2022). Skeletal muscle mass, strength, and function deteriorate with age; after age 60, muscle mass decreases by 1%, and strength decreases by 2.5–3% yearly (Franceschi et al., 2018; Kirk et al., 2020). In 2016, the WHO formally recognized sarcopenia as a disease, citing this

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physiological decrease as a contributing component. About 9.9% to 40.4% of the aged population suffers from sarcopenia, which is linked to a higher risk of falls, fractures, functional disability, and death (Beaudart et al., 2017; Bruyère et al., 2019; Liu et al., 2023).

Furthermore, because waning strength jeopardizes independence and heightens the fear of becoming a burden, numerous older persons view sarcopenia as more than just a loss of muscle; it is a rupture in identity (Rush et al., 2013; Soares et al., 2023). Research shows that frailty and sarcopenia are related, and older persons correlate sarcopenia to unfavorable perceptions. This demonstrates a larger opposition to being perceived as weak, sick, reliant, or needing medical attention (Lewis et al., 2025). The psychological impact of sarcopenia was highlighted by several older persons who experienced emotional anguish and frustration as a result of it (Thomas et al., 2022). Economic austerity has made these differences even worse; in Europe, aging populations have been disproportionately harmed by pension cuts and disjointed healthcare systems, turning sarcopenia from a medical diagnosis into a social determinant of health (Walsh et al., 2017). With an anticipated cost per person of $260 in 2019, sarcopenia has a substantial financial impact on the health system, amounting to $40.4 billion in the US. Ethnicity affects the costs; non-Hispanic Black women pay $25, whereas Hispanic women pay $548 (Tagliafico et al., 2022).

Early sarcopenia screening has been promoted as a crucial tactic for prompt intervention to solve this complicated issue. Decreased chance of hospitalization, early mortality, and muscle loss (Cruz-Jentoft et al., 2018; Gallo, 2024; Iragorri & Spackman, 2018). Screening tools now in use include physical performance tests (e.g., handgrip strength, gait speed), anthropometric measurements (e.g., calf circumference (CC)), middle upper arm circumference (AC, MUAC), BMI), and questionnaires (e.g., SARC-F, MSRA5, MSRA7) (Mohd Nawi et al., 2019). Although administering questionnaires is quick and straightforward, memory issues may lower accuracy. Despite their objectivity, physical examinations depend on patient consent and can be biased by the investigator.

Our study examines sarcopenia screening methods through a humanistic, person-centered lens, emphasizing cultural and social factors to promote equity and dignity for older adults while addressing concerns about diagnostic accuracy. These results will help medical practitioners choose the best instruments for specific groups and direct the creation of better screening techniques. This research will help guide public health initiatives and improve the health of community-dwelling older persons.

Methods

Study Protocol

The protocol for our systematic review was registered on the PROSPERO platform (registration number CRD42024512949). Our manuscript was prepared following the guidelines outlined in the PRISMA 2020 statement.

Eligibility Criteria

Inclusion criteria: (1) Community-dwelling adults aged ≥60; (2) Studies assessing sarcopenia screening tool accuracy with sensitivity, specificity, AUC, PLR, NLR; (3) Standard diagnostic criteria: EWGSOP, EWGSOP2, AWGS, FNIH, or IWGS; (4) Published in English to align with journal submission, though this introduced language bias and excluded non-English studies.

Exclusion criteria: (1) Meeting notes, letters, reviews, comments, editorials, or grey literature, ensuring standardized, peer-reviewed studies; (2) Studies with insufficient/inaccurate data, even

after contacting authors; (3) Duplicates or those without full text; (4) Studies on hospitalized, nursing home, primary care, social center, or outpatient populations, as sarcopenia screening tools focus on early detection in independent older adults, where prevention is more effective. In institutional settings, sarcopenia is often more advanced, requiring different diagnostic approaches.

Search Strategy

A systematic search of PubMed, Embase, Scopus, Google Scholar, and ResearchGate databases was conducted 10 years ago, and the literature retrieval date was February 20, 2024. The search strategy included four components based on the elements of the PIRD (Munn et al., 2018):

(1) **Population (P):** Older people: Elderly OR Aged Senior OR Geriatric OR Older OR Retirees OR Pensioners OR Gerontological

(2) **Reference Standard (R)**: Sarcopenia OR AWGS OR EWGSOP OR IWGS OR FNIH

(3) **Index Test (I)** Sarcopenia screening Tools: Screening OR SPSM OR MSRA OR Ishii score OR SARC-F OR SARC-F-EBM OR SARC-CalF OR U-TEST OR SarSA-Mod OR Calf circumference OR SARCO-GS

(4) **Diagnostic Accuracy (D)**: Sensitivity OR Specificity OR Likelihood Ratios OR PLR OR NLR OR predictive value OR PPV OR NPV OR ROC Curves OR AUC

The search used advanced mode with the Boolean operator "AND" to combine four components. A detailed search strategy for the four databases is in Appendix A. To ensure completeness, references from relevant studies and key journals on sarcopenia and geriatrics were manually screened for missing studies.

Study Selection and Data Extraction

After removing duplicates using EndNote, two independent reviewers (W.S & T.N) screened titles and abstracts using the inclusion and exclusion criteria. Full texts were reviewed when both reviewers deemed a study relevant or uncertain. Disagreements were resolved through discussion, with a third reviewer (H.T.N) making the final decision if necessary. The level of agreement between reviewers was quantified using Cohen's kappa statistic to assess inter-rater reliability. References of included studies were examined for additional eligible records. Three reviewers (H.T.N, A.W, and T.T.N) independently screened titles and abstracts of studies published in English. Full texts were then assessed for eligibility, with reasons for exclusion recorded. To ensure the inclusion of recent and relevant studies, we limited the selection to studies published between January 2014 and February 2024.

Data extraction was performed by three reviewers (H.T.N, C.N.L, and T.N) and verified by (W.S, D.T.N.H, and C.N.L). Extracted information included author names, publication year, country, study population, sample size, age, sex, reference standard for sarcopenia, cutoff values, sensitivity, specificity, PLR, NLR, PPV, NPV, AUC, Kappa statistic, ICC, Cronbach's α, statistical findings, and conclusions. Disagreements during data extraction were quantified using Cohen's kappa statistic, and final decisions were made through discussion with a third reviewer (T.T.N). To minimize bias arising from different diagnostic criteria, we agreed that studies using multiple diagnostic criteria would apply the latest AWGS criteria for Asian countries and the updated EWGSOP criteria for other regions.

Quality Assessment

Following PRISMA-DTA recommendations, two reviewers (H.T.N. & C.N.L.) evaluated studies using QUADAS-2, which covers four domains: patient selection, index test, reference standard, and flow and timing. Each domain was rated for risk of bias and applicability as "Low," "High," or "Unclear," with discrepancies resolved by C.S. The COSMIN checklist assessed measurement properties, focusing on content validity, construct validity, reliability, internal consistency, cross-cultural validity, and criterion validity. Scores ranged from 1 (inadequate) to 4 (excellent), with the lowest score in each category determining the overall rating.

Statistical Analysis

Funnel plots were used to detect potential publication bias, while forest plots displayed individual study outcomes, presenting pooled estimates of diagnostic accuracy and confidence intervals. These visual tools provided insights into the consistency of results and the performance of screening tools.

Data Analysis

R software (version 4.3.1) was used for statistical analysis and data synthesis, with the "mada" package for diagnostic test accuracy. Meta-analyses were conducted if at least two studies were available for an index test. Although four studies are typically recommended for robustness, sarcopenia research is still emerging, and excluding tools with fewer studies could overlook promising ones.

Bivariate random-effects models calculated pooled estimates of sensitivity, specificity, PLR, NLR, and AUC. An AUC of ≥ 0.9 indicates high accuracy, 0.7–0.9 moderate, and 0.5–0.7 low. If fewer than two studies were available, individual 2x2 tables were constructed instead. Forest plots showed pooled estimates and heterogeneity (I^2 statistic), and funnel plots assessed publication bias, with symmetry indicating low risk and asymmetry suggesting bias.

Results

Study Selection

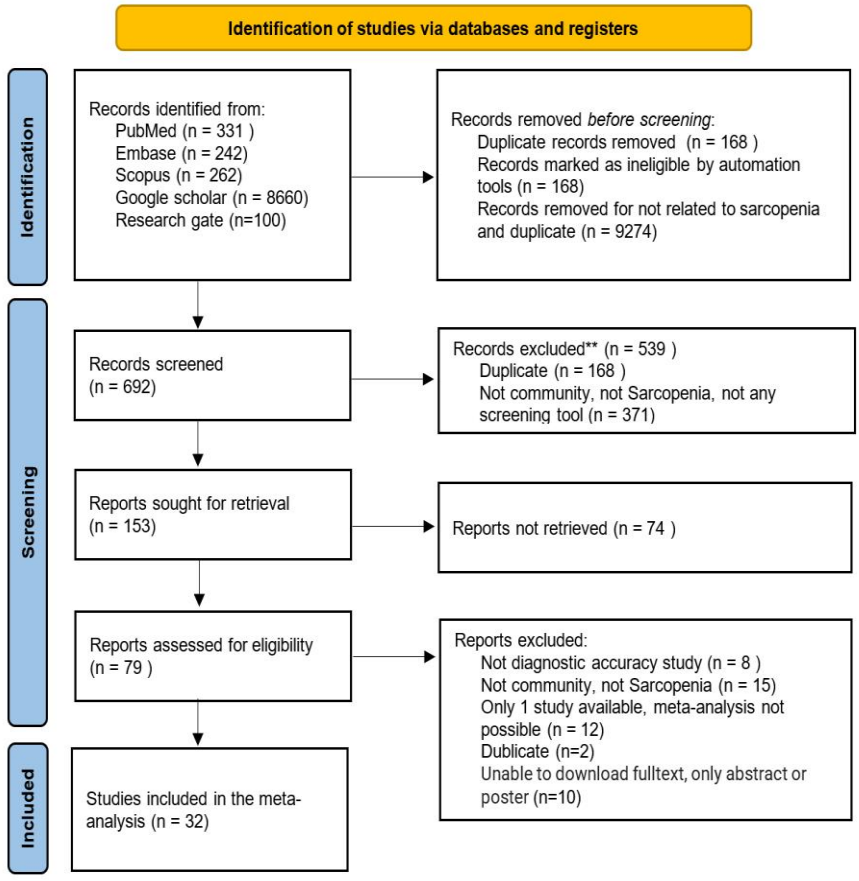

Figure 1. Selection of Studies

Figure 1 presents the PRISMA flow diagram outlining the study selection process. Initially, 9,595 publications were identified. After eliminating duplicates, 8,903 titles were screened, excluding 539 publications based on their abstracts. Subsequently, full-text retrieval was sought for 153 publications, of which 74 were excluded. After assessing 79 studies for eligibility, 47 were excluded for reasons detailed in Figure 1. Ultimately, 32 studies were included in the final review.

Risk of Bias in Studies

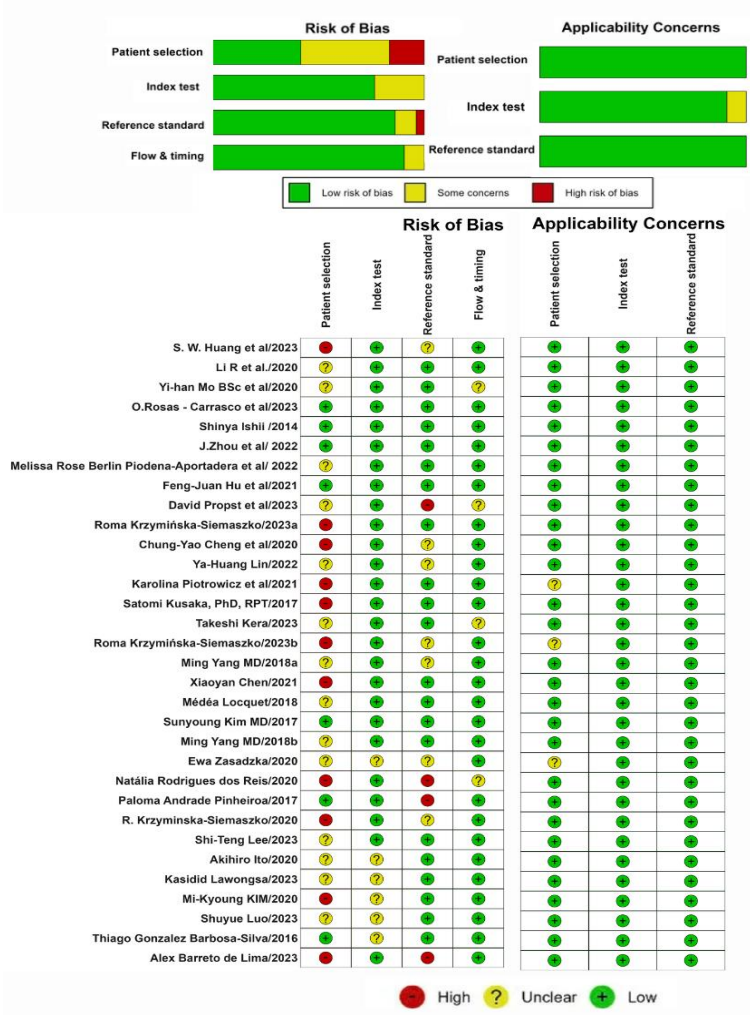

Figure 2. Checking Risk of Bias via QUADAS-2

Among the 32 included studies, 4 had a low risk of bias in all 7 QUADAS-2 items, 15 had a low to moderate risk, and 13 had a moderate to high risk. Patient selection bias was mainly due to convenience sampling and voluntary participation, but systematic selection and well-applied inclusion/exclusion criteria helped to minimize its impact. Reference standard bias was related to using low-frequency (not multi-frequency) BIA machines or predictors of muscle mass by the anthropometric equation. Applicability concerns were generally low, with some unclear risks due to small sample sizes or unrepresentative convenience sampling. Index test bias mainly stemmed from non-predefined thresholds and descriptions of insufficient screening tool measurement methods. After careful consideration, we decided to exclude four studies that did not measure muscle mass by specific machines such as BIA or DEXA to limit selection bias. Because of that, one study was excluded because the MUAC tool had only one study left, which could not be included in the meta-analysis. Finally, 27 studies were included in the further analysis.

Stability and reliability analysis using SROC curves showed that the Ishii instrument was the most reliable and stable. Generally, combined instruments like Ishii, SARC-CalF + AC, and SARC-CalF performed well, with their composite estimates (red diamond) situated close to the upper left corner (indicating low false positives and high sensitivity) and showing consistent results across studies (small confidence regions). In contrast, the questionnaire-only instrument (MSRA7 > MSRA5 > SARC-F) had the least reliability (Figure 3)

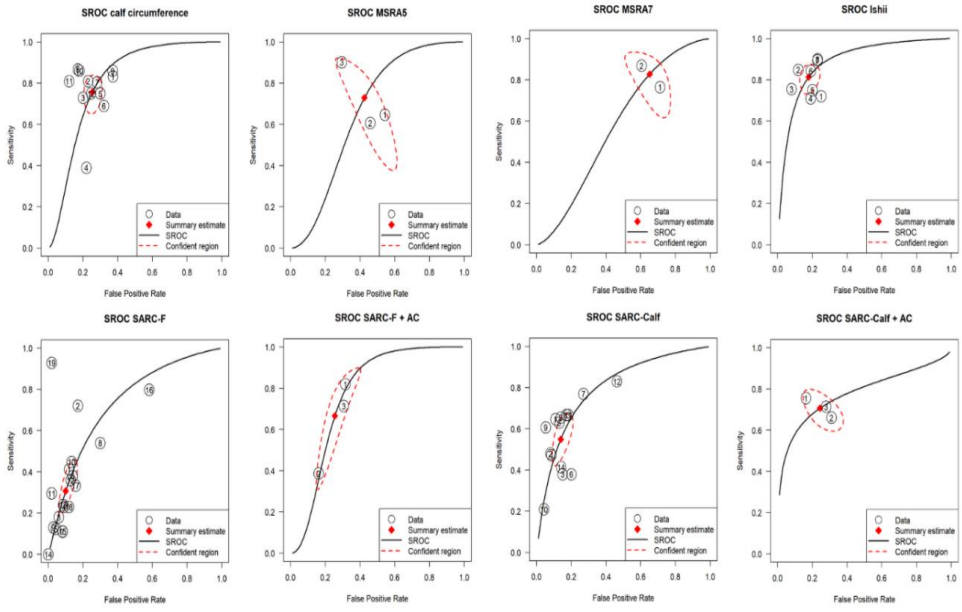

Figure 3. The SROC Curve for Eight Sarcopenia

The funnel plots for sensitivity, specificity, and AUC show symmetry, suggesting no significant publication bias. Although the confidence regions are relatively broad, indicating some variability in precision, there is evidence of heterogeneity in some cases, particularly for sensitivity and AUC. The overall summary estimates for each metric are stable; we further analyze the forest plot for heterogeneity to get a more definitive conclusion. (Appendix E,F,G,H)

The GRADE framework was used to assess the certainty of pooled diagnostic accuracy; only SARC-F+ AC tool showed high-certainty evidence across all diagnostic measures. Most other tools had moderate certainty, with lower PPVs than NPVs, suggesting more substantial rule-out utility (Appendix I)

Study Characteristics

No.	Author_year	Country/ Continent	Tool validation	Reference standard	Study design	Prevalence of	Sample size (age, gender)			
							Male	Female	Total	Age (mean)

						sarcopenia				
1	S. W. Huang et al/2023 (Huang et al., 2023)	China/ Asia	AB3C model, CC, SARC-F, IShii	AWGS 2019	Cross-sectional	11.90%	522	474	996	68.7 ± 10.3
2	Li R et al./2020 (Li et al., 2020)	China/ Asia	cSARC-CaIF, SARC-F, SARC-Calf	AWGS 2019	Cross-sectional	8.60%	546	463	1009	68.1 ± 6.3
3	Yi-han Mo BSc et al/2020 (Mo et al., 2021)	China/ Asia	CC, SARC-F, SARC-Calf	AWGS 2019	Longitudinal + Cross-sectional	25%	347	703	1050	70.3 ± 7.5
4	O.Rosas-Carrasco et al/2023 (Rosas-Carrasco et al., 2023)	Mexico/ South America	SARCO-GS, SARC-F, SARC-Calf	EWGSOP2	Cohort study	54.60%	169	683	852	68.9 ± 10.21
5	Shinya Ishii /2014 (Ishii et al., 2014)	Japan/ Asia	Ishii	EWGSOP	Cross-sectional	14.20%	977	994	1971	≥65
6	J.Zhou et al/ 2022 (Zhou et al., 2022)	China/ Asia	SARC-F, SARC-F + AC, SARC-Calf, SARC-Calf + AC	AWGS 2019	Cross-sectional	26.40%	199	202	401	70.51 ± 6.18
7	Melissa Rose Berlin Piodena-Aportadera et al/ 2022 (Piodena-Aportadera et al., 2022)	Singapore/ Asia	CC	AWGS 2019	Cross-sectional	17.40%	48	128	176	66.8 ± 7.1

8	Feng-Juan Hu et al/2021 (F.-J. Hu et al., 2021)	China/ Asia	MUAC, CC	AWGS 2019	Cross-sectional	29.60 %	1615	2894	4509	≥50
9	Roma Krzymińska-Siemaszko/2020 (Krzyminska-Siemaszko et al., 2020)	Poland/ Europe	SARC-F, SARC-Calf, SARC-F + EBM	EWGSOP2	Cross-sectional	13.90 %	34	81	115	74.2 ± 6.7
10	Chung-Yao Cheng et al/2020 (Chen et al., 2020)	Taiwan/ Asia	SARC-F, CC, MSRA-5, SARC-Calf	AWGS 2019	Cross-sectional	52 %	93	84	177	78.7 ± 8.6 M 81.1 ± 6.8 F
11	Ya-Huang Lin/2022 (Lin et al., 2023)	Taiwan/ Asia	SARC-F, CC, SARC-Calf	AWGS 2019	Cross-sectional	40.70 %	64	145	209	77.7 ± 7.2
12	Satomi Kusaka, PhD, RPT/2017 (Kusaka et al., 2017)	Japan/ Asia	CC	AWGS	Cross-sectional	9.40%	0	116	116	73.1
13	Takeshi Kera/2023 (Kera et al., 2023)	Japan/ Asia	SARC-F, RSS	AWGS	Cohort study	9.20%	249	434	683	73.9 ± 6.7
14	Roma Krzymińska-Siemaszko/2023 (Krzyminska-Siemaszko et al., 2023)	Poland/ Europe	SARC-F, SARC-Calf, SARC-F+EBM, SARC-F+AC, SARC-CalF+AC	EWGSOP2	Cross-sectional	11.20 %	102	158	260	72.1 ± 6.7

15	Ming Yang MD/2018 (Yang et al., 2018)	China/ Asia	SARC-F, SARC-CalF	AWGS	Cross-sectional	15.90%	160	224	384	71.5 ± 5.8
16	Xiaoyan Chen/2021 (Chen et al., 2021)	China/ Asia	Ishii	AWGS 2019	Cross-sectional	19.90%	462	479	941	≥60
17	Médéa Locquet/2018 (Locquet et al., 2018)	Belgium/ Europe	SARC-F, IShii	EWGSOP	Cross-sectional	16.70%	124	182	306	74.8± 5.9
18	Sunyoung Kim MD/2017 (Kim et al., 2018)	Korea/ Asia	SARC-F	AWGS	Cohort study	10.20%	577	645	1222	≥70
19	Ming Yang MD/2018_2 (Yang et al., 2019)	China/ Asia	SARC-F, MSRA-7, MSRA-5	AWGS	Cross-sectional	15.90%	160	224	384	71.5 ± 5.8
20	Ewa Zasadzka/ 2020 (Zasadzka et al., 2020)	Poland/ Europe	SARC-F	EWGSOP2	Cross-sectional	20.90%	54	13	67	≥65
21	R. Krzyminska-Siemaszko/2020 (Krzyminska-Siemaszko et al., 2021)	Poland/ Europe	SARC-F, SARC-Calf, MSRA-7, MSRA-5	EWGSOP2	Cross-sectional	17%	21	79	100	≥65
22	Shi-Teng Lee/2023 (Lee et al., 2023)	Korean/ Asia	SARC-F, SARC-CalF, SARC-F+AC,	AWGS 2019	Cross-sectional	27%	63	167	230	67.2 ± 7.4

			SARC-CalF+AC							
23	Akihiro Ito/2020 (Ito et al., 2021)	Japan/ Asia	CC, SARC-F, SARC-CalF	AWGS 2019	Cross-sectional	12.90 %	25	114	139	76.7 ± 6.6
24	Kasidid Lawongsa /2023 (Lawongsa et al., 2024)	Thailand/ Asia	CC, Yubi wakka	AWGS 2019	Cross-sectional	(9.6% M, 20.4% F)	73	157	230	69 ± 6.0
25	Mi-Kyoung KIM/2020 (KIM et al., 2020)	Korea/ Asia	SARC-F	AWGS 2019	Cross-sectional	41 %	134	254	388	77.80 ± 6.26
26	Shuyue Luo/2023 (Luo et al., 2023)	China/ Asia	Ishii	AWGS 2019	Cross-sectional	15.70 %	1509	2668	4177	≥50
27	Thiago Gonzalez Barbosa-Silva/2016 (Barbosa-Silva et al., 2016)	Brazil/ South America	SARC-F	EWGSOP	Cross-sectional	8.40%	69	110	179	≥60

Table 1. Characteristics of Studies Included in the Systematic and Meta-Analysic Review

The analysis included 27 studies validating 8 sarcopenia screening tools in 21,271 older adults. Among them, 9 studies assessed anthropometric tools (CC: (Chen et al., 2020; F.-J. Hu et al., 2021; Huang et al., 2023; Ito et al., 2021; Kusaka et al., 2017; Lawongsa et al., 2024; Lin et al., 2023; Mo et al., 2021; Piodena-Aportadera et al., 2022)), 24 studies evaluated questionnaire-only tools (19 on SARC-F: (Barbosa-Silva et al., 2016; Chen et al., 2020; Huang et al., 2023; Ito et al., 2021; Kera et al., 2023; KIM et al., 2020; Kim et al., 2018; Krzyminska-Siemaszko et al., 2023; Krzyminska-Siemaszko et al., 2021; Lee et al., 2023; Li et al., 2020; Lin et al., 2023; Locquet et al., 2018; Mo et al., 2021; Rosas-Carrasco et al., 2023; Yang et al., 2018; Zasadzka et al., 2020; Zhou et al., 2022), two on MSRA7: (Krzyminska-Siemaszko et al., 2021; Yang et al., 2018) , three on MSRA5: (Chen et al., 2020) (Krzyminska-Siemaszko et al., 2021; Yang et al., 2018)), 20 studies examined combined anthropometric and questionnaire tools (3 on SARC-F + AC: (Krzyminska-Siemaszko et al., 2023; Lee et al., 2023; Zhou et al., 2022), 14 on SARC-Calf: (Barbosa-Silva et al., 2016; Chen et al., 2020; Ito et al., 2021; KIM et al., 2020; Krzyminska-Siemaszko et al., 2023; Krzyminska-Siemaszko et al., 2021; Lee et al., 2023; Li et al., 2020; Lin et al., 2023; Mo et al., 2021; Rosas-Carrasco et al., 2023; Yang et al., 2018; Zhou et al., 2022) , three on SARC-calf + AC: (Krzyminska-Siemaszko et al., 2023; Lee et al., 2023;

Zhou et al., 2022)), and five studies combine multiple methods tools_anthropometric + questionnaire + physical performance test (Ishii: (Chen et al., 2021; Huang et al., 2023; Ishii et al., 2014; Locquet et al., 2018; Luo et al., 2023)). Asia had the most studies (20/27, 19,392 older adults), followed by Europe (5/27, 848 participants) and South America (2 studies, 1,031 participants).

Kind of tools	Tool	number of studies	Study (sample)	Pooled sensitivity	I^2	Pooled specificity	I^2	Pooled AUC	I^2	PLR_mean	NLR_mean
Anthropometric	Calf circumference	9	**7,602**	0.7 (0.57–0.83)	93%	0.73 (0.69-0.77)	92%	0.84 (0.8-0.87)	86%	3.34	0.31
Questionnaire	MSRA5	3	661	0.73 (0.53–0.93)	90%	0.58 (0.43-0.72)	90%	0.7 (0.53-0.86)	95%	1.87	0.57
	MSRA7	2	484	0.85 (0.77-0.94)	0%	0.35 (0.25-0.45)	70%	0.69 (0.65-0.73)	44%	1.24	0.56
	SARC-F	19	8777	0.35 (0.22–0.47)	97%	0.86(0.79-0.94)	97%	0.68 (0.62-0.73)	95%	5.65	0.73
	Sum_Quest	**24**	**9922**	**0.46(0.33-0.59)**	**97%**	**0.76(0.66-0.86)**	**98%**	**0.68 (0.63-0.72)**	**95%**	**2.92**	**0.62**
Quest + Anthro	SARC-F + AC	3	901	0.8 (0.73–0.87)	13%	0.69 (0.65-0.73)	0%	0.76 (0.68-0.83)	69%	2.48	0.46
	SARC-Calf	14	5,503	0.57 (0.47-0.67)	91%	0.84 (0.77-0.91)	93%	0.76 (0.7	93%	4.5	0.52

								1-0.8)			
	SARC-Calf + AC	3	901	0.75 (0.67-0.82)	0 %	0.78 (0.67-0.89)	89 %	0.79 (0.72-0.87)	75 %	3.11	0.39
	Sum_Quest + Anthro	**20**	**7305**	**0.62(0.54-0.71)**	**91 %**	**0.81(0.75-0.87)**	**94 %**	**0.76 (0.73-0.8)**	**91 %**	**3.36**	**0.46**
Anthro + Phys + Quest	Ishii	5	**8,391**	0.79 (0.67–0.91)	85 %	0.78(0.72-0.83)	79 %	0.89 (0.85-0.92)	83 %	4.91	0.24

Table 2. Summary Diagnostic Performance and Heterogeneity for Sarcopenia Screening Tools

*When $I^2 > 50\%$ indicates a significant difference between studies, the total random effect is the choice for pooling estimates because it considers the actual variation between studies. Low heterogeneity ($I^2 < 50\%$, the difference between studies is not significant; choose total common effect)

Table 2 describes the pooled accuracy of eight screening tools for sarcopenia in community-dwelling older adults, clarified into four groups according to the characteristics of the tools; all studies reported AUC values greater than the "indiscriminate" threshold of 0.5, indicating that these screening tools are effective in identifying sarcopenia in the older adults assessed. The combination of Anthro + Phys + Quest (Ishii) was the most accurate diagnostic tool, with the highest AUC (0.89) and lowest NLR (0.24), the best diagnostic and exclusion tool. The group, including only the anthropometric index (calf circumference), also performed very well (CC) with pool AUC (0.84). When Quest + Anthro was combined, the accuracy was higher than that of the questionnaire only but lower than that of the anthropometric alone. For example, the pooled AUC of CC is 0.84, but when CC is combined with five questions of SARC-F (pooled AUC: 0.68), the pooled AUC of SARC-Calf is 0.76. The questionnaire was the worst performance tool, with the lowest AUC (0.68), lowest sensitivity (0.46), and highest NLR (0.62). Looking at the individual tools, the tool that showed the highest overall diagnostic performance for sarcopenia was Ishii (AUC: 0.89 (0.84-0.91)) and calf circumference (AUC: 0.84 (0.8-0.87)); the lowest overall performance was the SARC-F tool (AUC: 0.68 (0.62-0.73)), and SARC-F also had the lowest pooled sensitivity (0.35), indicating that only 35% of people with the disease were detected, and the highest NLR (0.73), meaning if a person tested negative, they were still 73% more likely to have the disease.

Continents	**Tools**	number of studies	Study (sample)	**Pooled sensitivity**	**I^2**	**Pooled specificity**	**I^2**	**Pooled AUC**	**I^2**
Asia (8 tools)	CC	9	7602	0.70 (0.57-0.83)	93%	0.73 (0.69-0.77)	92%	0.84 (0.8-0.87)	86%
	MSRA5	2	561	0.76 (0.57-0.83)	95%	0.63 (0.47-0.79)	85%	0.73 (0.48-0.97)	97%
	MSRA7	1	384	0.87 (0.76-0.94)	-	0.4 (0.34-0.45)	-	0.7 (0.65-0.74)	-
	SARC-F	12	6888	0.33 (0.13-0.52)	98%	0.86 (0.74-0.99)	98.1%	0.65 (0.59-0.71)	96%
	Sum_Quest	**15**	**7833**	**0.45(0.26-0.65)**	**98%**	**0.78(0.65-0.91)**	**98.8%**	**0.66(0.61-0.72)**	**96%**
	SARC-F + AC	2	631	-	-	-	-	0.75 (0.64-0.86)	85%
	SARC-Calf	9	3987	0.53 (0.4-0.67)	95%	0.83 (0.71-0.95)	96%	0.76 (0.69-0.82)	95%
	SARC-Calf + AC	2	631	-	-	-	-	0.8 (0.69-0.9)	86%
	Sum_Quest + Anthro	**13**	**5249**	**0.6 (0.47-0.73)**	**95%**	**0.81(0.72-0.91)**	**96.1%**	**0.76(0.72-0.81)**	**94%**
	Ishii	4	8085	-	-	-	-	0.89(0.85-0.92)	84%
Europe (7 tools)	MSRA5	1	100	0.65 (0.38-0.86)	-	0.46(0.35-0.57)	-	0.62 (0.46-0.78)	-
	MSRA7	1	100	0.76 (0.5-0.93)	-	0.29(0.2-0.4)	-	0.59(0.43-0.75)	-
	SARC-F	5	858	0.37 (0.32-0.42)	**0%**	0.87 (0.84-0.89)	0%	0.77 (0.67-0.88)	86%

	Sum_Quest	**7**	**1058**	**0.49(0.36-0.62)**	**72%**	**0.71(0.5-0.91)**	**97%**	**0.73(0.64-0.83)**	**86%**
	SARC-F + AC	1	270	0.71 (0.51-0.87)	-	0.69 (0.63-0.75)	-	0.77 (0.66-0.88)	-
	SARC-Calf	3	485	0.65 (0.52-0.77)	**0%**	0.87 (0.84-0.9)	0%	0.77 (0.69-0.85)	0%
	SARC-Calf + AC	1	270	0.71 (0.51-0.87)	-	0.72(0.66-0.78)	-	0.77(0.66-0.89)	-
	Sum_Quest + Anthro	**5**	**1025**	**0.68(0.59-0.77)**	**0%**	**0.81(0.73-0.89)**	**88%**	**0.77(0.71-0.83)**	**0%**
	Ishii	1	306	0.85 (0.81-0.88)	-	0.81(0.76-0.85)	-	0.86 (0.81-0.91)	-
South America	SARC-F	2	1031	-	-	-	-	0.62 (0.57-0.66)	0%
	SARC-Calf	2	1031	-	-	-	-	0.69 (0.65-0.74)	0%

Table 3. Summary Estimates of Pooled Diagnostic Accuracy by Continents

*When $I^2 > 50\%$ indicates a significant difference between studies, the total random effect is the choice for pooling estimates because it considers the actual variation between studies. Low heterogeneity ($I^2 < 50\%$, the difference between studies is not significant; choose total common effect)

When analyzing the performance of tools by continent, Asia validated eight tools, Europe lacked tools for the anthropometric index (seven tools), and South America had only two validated tools. Asia and Europe showed Ishii as the best tool for overall diagnostic performance, while SARC-F was the least accurate and had the lowest sensitivity across all continents. In the questionnaire group, MSRA5 and MSRA7 performed quite well overall in Asia (AUC > 0.7), with high sensitivity (0.76 and 0.87), but in Europe, they did not perform as a good screening tool (AUC 0.62 and 0.59, respectively). The combined anthropometric and questionnaire groups performed relatively well and were similar in Asia and Europe (AUC = 0.76 and 0.77), while in South America, the pooled AUC of SARC-Calf was 0.69.

If studies had high heterogeneity, $I^2 > 50\%$, the total random effect was chosen to adjust for this difference. When analyzing the continental subgroup, we found that studies in Asia had higher I^2, which may affect the accuracy of the screening tool in Asia. However, subgroup analysis by sex and age was not performed due to incomplete data from the studies.

Discussion

The analysis of 27 studies revealed a distinct geographical distribution, heavily concentrated in Asia (20), with fewer in Europe (5) and South America (2), and notably absent from North

America, Australia, or Africa. This distribution may be attributed to our inclusion criteria, which focused on community-based studies rather than those conducted in hospitals, nursing homes, or other institutions. This interpretation is bolstered by the cultural contexts of the represented regions: strong traditions favoring family-based care and multigenerational living, supported by values like filial piety in Asia (Rahman, 2013), strong family bonds in Europe and South America, and demographic history in developing regions (Nations, 2023), make community-focused studies more feasible or relevant there. Cultural norms emphasizing respect towards elders in Latin America (Toyokawa et al., 2022) further support community care, contrasting with mainstream Australian culture's greater acceptance of nursing homes, although even there, subcultures like Greek Australians often prefer traditional family care (Fitzgerald et al., 2001), underscoring how a community focus inherently shapes geographical findings.

Questionaire Tools Group

The most widely validated screening method, this group includes 24 studies of SARC-F (19 studies) MSRA-5 (3 studies) and MSRA-7 (2 studies). High sensitivity is crucial for community screening to ensure early disease detection and avoid missed cases (Canada, 2024). Questionnaire-only tools showed the lowest diagnostic accuracy (AUC: 0.68 [0.63–0.72]) and sensitivity (0.46 [0.33–0.59]), making them unsuitable as stand-alone tools. Thus, we believe questionnaires should not be used alone to screen for sarcopenia in community-dwelling elderly. Instead, they should be combined with objective methods like anthropometric or physical performance tests (PPTs), as their accuracy depends on the elderly's memory, comprehension, and cooperation (Chua et al., 2024).

When considering each type of tool separately, the SARC-F is the most widely used but has a low sensitivity (0.35 (0.22–0.47)). According to Barbosa-Silva et al., the low sensitivity of the SARC-F is due to five questions focusing only on muscle function (Strength, Assistance walking, Rise from chair, climbing stairs, and Falls), ignoring the assessment of muscle mass (Barbosa-Silva et al., 2016). In our opinion, the SARC-F is only suitable for hospital screening in subjects with severe sarcopenia affecting motor function but cannot be detected early in the community. MSRA (Mini Sarcopenia Risk Assessment): Developed by Rossi et al. (Li et al., 2025), the MSRA-7 assesses factors including age, number of hospitalizations, physical activity level, meal regularity, milk consumption, protein consumption, and weight loss.8 The MSRA-5 eliminates two questions on milk and protein consumption. The aim of MSRA is to assess general and nutritional risk factors related to sarcopenia, unlike SARC-F, which focuses on function (Chua et al., 2024; Rossi et al., 2017). It is interesting to note that MSRA-7 has two more questions than MSRA-5 with the same five questions, but MSRA5 has a higher screening efficiency than MSRA7, suggesting that the effectiveness of the tool does not depend on the number of questions; adding inappropriate questions may reduce the diagnostic performance of the tool.

By continent, in Asia, SARC-F had lower overall diagnostic performance than MSRA7 and MSRA5 (AUC 0.65, 0.7, and 0.73, respectively), while in Europe, SARC-F outperformed the other two tools (AUC 0.77, 0.59, 0.62, respectively). In our opinion, this difference, in addition to the difference in diagnostic criteria for sarcopenia (AWGS in Asia and EWGSOP in Europe), is also due to differences in cultural characteristics, lifestyle, diet, and body size composition between the two continents. SARC-F was designed in the US (Malmstrom & Morley, 2013), focusing on functional assessment in Western elderly people - a population that often lives independently and tends to proactively recognize and report limitations in daily activities. In

contrast, in Asia, due to differences in physical conditions and cultural factors, this tool is likely to miss potential cases of sarcopenia (Li et al., 2025) (Beaudart et al., 2016). In contrast, in many Asian countries, East Asian culture tends to avoid admitting weakness or dependence. ; some older people may be reluctant to report falls or frailty for fear of becoming a burden (Hinton et al., 2009; Yang et al., 2020). These differences lead to SARC-F underestimating the risk in Asia. In Asia, the elderly often have a sedentary lifestyle, with little physical activity even before sarcopenia. As a result, muscle loss in Asia can progress silently – because they are inherently sedentary, the SARC-F cannot detect changes (because they do not climb stairs much, do not carry heavy loads, etc.) (Zhang et al., 2023). In contrast, the MSRA integrates risk factors that are more appropriate to the Asian context and has questions about exercise habits and weight loss, so it is more sensitive to the sedentary lifestyle and poor nutritional status in Asia (Bhat et al., 2024). MSRA7 performs worse than MSRA5 because of the addition of questions about milk and protein consumption frequency, which are not the same across cultures, and lactose intolerance between ethnic groups, reducing the accuracy of MSRA7 despite having more questions (Chua et al., 2024; Review, 2025).

Although not included in the meta-analysis because of only one study, the rapid muscle atrophy screening questionnaire (RSS) from Japan showed promising diagnostic accuracy (AUC: 0.81) (Kera et al., 2023). The RSS includes four questions on muscle strength and age, as well as major risk factors for muscle atrophy. It shows that questionnaire-only tools can improve diagnostic validity if appropriate questions are included. However, further validation studies are needed.

Anthropometric Tools Group

This group of tools included only a simple anthropometric index. However, it was the group of tools that showed the second-best overall screening performance in screening for sarcopenia in community-dwelling older adults (AUC: 0.84) after the three-method combination group (Anthropometry + PPT + Questionnaire) showing that the anthropometric index is a simple, quick, noninvasive, inexpensive tool that is not affected by dementia in the elderly like the questionnaire group and is not affected by subjective, psychological factors of the patient like the physical performance test.

Although only CC had sufficient quantity and quality of studies to be included in the analysis, we also found screening tools that included only one anthropometric index used to screen for sarcopenia in other older adults, divided into two main groups: those reflecting limb muscle mass (CC, MUAC/AC, MAMC/AMA) used to screen for sarcopenia (F. J. Hu et al., 2021) and those reflecting central fat or obesity (BMI, WC, WHR, WHtR, WWI) related to sarcopenic obesity (Kim et al., 2023). Of these, CC and MUAC generally performed well in predicting low muscle mass or screening for sarcopenia; the performance between the two indices was similar in men, CC may be slightly better in women, and MUAC was more favorable in the presence of lower limb edema(F. J. Hu et al., 2021). MUAC has an AUC of 0.7–0.86, better sensitivity than CC (0.71–0.88), and specificity (0.7–0.78) (F.-J. Hu et al., 2021; Piotrowicz et al., 2021). Thus, CC is a strong candidate due to its simplicity, good evidence base, and correlation with muscle mass and function, supporting its use as a reliable screening tool for sarcopenia (Ishihara et al., 2024; Kawakami et al., 2015). MUAC also shows a strong correlation with ASMI, accurately reflects lean muscle mass, and is less affected by peripheral edema in the elderly, thus being considered a viable alternative to ASMI with specific diagnostic thresholds (F. J. Hu et al., 2021).

Other anthropometric tools, such as BMI, waist circumference (WC), and the Yubi-Wakka test

(an indirect test that measures CC using a ring made from the patient's thumb and index finger), have also shown promising results (Esteves et al., 2020). Anthropometric indexs have the advantages of being inexpensive, noninvasive, easy to perform, completely objective, unaffected by patient memory or cooperation, and flexible across various contexts, making them particularly useful in resource-poor healthcare settings. However, the accuracy of these measures varies between studies. It may be affected by peripheral adiposity or edema (e.g., MUAC in women, CC in lower-limb edema, BMI in obese individuals) (Cheong et al., 2022; Li et al., 2024). Therefore, it is important to prioritize the use of cutoffs appropriate to each specific population and setting and to be cautious when applying general cutoffs, as significant variability has been reported.

Anthropometric Combined with Questionnaire Group

This group includes 20 eligible studies included in the analysis, including three tools SARC-F + AC (3 studies, SARC-Calf (SARC-F + CC, 14 studies), SARC-Calf + AC (SARC-F + CC + AC, three studies) in addition to the SARC-F + EBM tool not included in the analysis (Krzyminska-Siemaszko et al., 2020; Krzyminska-Siemaszko et al., 2023). In our opinion, this combination has not achieved the desired effect because the SARC-F tool itself has too low sensitivity; when combined with anthropometric measurements, it reduces the overall diagnostic performance accuracy of each anthropometric index (for example, the pooled AUC of CC is 0.84, but when combining CC with SARC-F, the SARC-calf tool has a pooled AUC of only 0.76). This demonstrates that in order to increase diagnostic effectiveness, the questions must be modified to fit the population and make sure they are enough accuracy before being combined with anthropometric indications. By continent, except for Asia, other regions have not validated sarcopenia screening using individual anthropometric indicators; only the combination group also showed that when combined with anthropometric indicators, it will improve the diagnostic performance of the questionnaire group.

Questionnaire Combining Anthropometric and Physical Performance Tools Group

This category includes only the Ishii tool (5 studies), which assesses age, CC, and grip strength. It achieved the highest diagnostic accuracy (AUC: 0.89 (0.85–0.92)) and the best ability to exclude muscle atrophy (NLR: 0.24), demonstrating the value of combining multiple assessment methods. Previously, the diagnosis of sarcopenia was mainly based on loss of skeletal muscle mass as the core feature. However, with recent international consensuses such as EWGSOP2 and AWGS, the focus has shifted to muscle strength, which is considered the main sign and the first step to suspect sarcopenia. Low muscle mass or quality confirms the diagnosis, while poor physical performance helps classify the severity (Cruz-Jentoft et al., 2018; Martone et al., 2019; Sayer & Cruz-Jentoft, 2022). Since muscle strength loss is an early warning sign, an effective screening tool should directly or indirectly assess muscle quality, and a comprehensive assessment of both muscle mass and muscle quality should provide the best diagnostic performance, including anthropometric indices (estimating muscle mass), functional tests (assessing strength), and self-reported questions related to muscle function.

However, Ishii's reliance on handgrip measurement may limit its feasibility in the community setting, especially in areas lacking specialized medical equipment. Standalone physical performance tests (e.g., SPPB, CS-30, and 4mWS) have demonstrated high accuracy (AUC: 0.72–0.84), reinforcing the importance of functional assessments in screening for sarcopenia(Akın et al., 2015; Lee et al., 2021; Pinheiro et al., 2016; Sawada et al., 2021). Therefore, further studies are needed to determine whether incorporating a simple physical

performance test to assess indirect muscle strength in place of handgrip may be more feasible in the community without compromising accuracy in screening for sarcopenia in the elderly. However, performing PPTs also has some disadvantages, such as being time-consuming (e.g., SPPB takes about 10 minutes), requiring suitable space (such as a hallway long enough for a 6-meter walk), and some basic equipment (stopwatch, chair, markers, etc.) (Cruz-Jentoft et al., 2018), the results can also be affected by patient cooperation and are not suitable for some subjects such as those with severe motor, balance or cognitive impairment. This highlights how important it is to conduct more research, assess how well PPTs work with various populations, choose more sensitive and specific methods that are appropriate for each population, and successfully supplement strength and muscle mass measurements in both diagnosis and monitoring.

Strengths and Limitations

Our systematic review is the first to comprehensively evaluate screening tools for sarcopenia in community-dwelling older adults. Unlike previous reviews focusing solely on accuracy, we considered factors influencing tool performance. We analyzed studies from the past decade, reviewed reference lists, and consulted experts. Quality was assessed using QUADAS-2, and measurement properties were assessed using COSMIN Rob. To reduce bias, we used Funnel and Forest plots and standardized diagnostic criteria across continents.

Limitations include language restrictions, exclusion of single-study validations, and high heterogeneity across studies, particularly in Asia, which may affect the accuracy of results and reflect the diversity within these geographic regions. Research is most concentrated in Asia, followed by Europe and South America, with no other regions showing geographical differences in research intensity.

Conclusion

Overall, this study demonstrates considerable variability in the diagnostic performance of sarcopenia screening tools, each with its limitations and an important role in clinical practice and public health. Comprehensive assessments of muscle mass and quality (such as Ishii) provide the highest accuracy. However, anthropometric indices that accurately reflect muscle mass (such as CC) are an effective and practical alternative in resource-poor settings. In contrast, questionnaire-based tools, such as the SARC-F, have the lowest performance and inferior sensitivity, making them unsuitable for stand-alone tools in community screening because they miss many cases. Combining a questionnaire with an anthropometric index (such as the SARC-F and CC to form the SARC-Calf) improves performance compared to questionnaires alone (SARC-F). However, it reduces accuracy compared to anthropometric indices alone (CC).

The performance of sarcopenia screening tools varies considerably across continents, reflecting differences in cultural characteristics, lifestyles, diets, body composition, and diagnostic criteria. Tools with high specificity and PPV should be prioritized in low-incidence areas, while in endemic areas, high sensitivity and NPV should be focused on to minimize missed cases (Cruz-Jentoft et al., 2018). Therefore, tools or cutoffs should not be applied mechanically but flexibly adapted to each local context to optimize screening effectiveness. To improve accuracy and feasibility, future studies should consider combining multiple screening methods, limiting dependence on specialized equipment, refining questionnaires, validating PPTs, and developing region-specific anthropometric thresholds. A comprehensive and multifactorial approach will improve early diagnosis, timely intervention, and global quality of life for older adults.

In addition, screening needs to consider the complex interactions between physical health and the sociocultural environment. This is particularly relevant in Asia, where lifestyle factors (e.g., sedentary lifestyle, specific diets) and cultural attitudes (e.g., fear of admitting frailty or becoming a burden) directly influence the detection of sarcopenia. To make screening an engaging, community-based activity that honors cultural identity and advances health equity, we suggest incorporating basic screening procedures into older individuals' everyday communal activities.

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Cultural Contexts Meet Clinical Precision: A Systematic Review and Meta-Analysis of Sarcopenia Screening Tools in Global Aging Communities

Appendix A: Search terms

Appendix B: Database search strategies

Appendix C: List of excluded studies with reasons

Appendix D: COSMIN Risk of bias checklist

Appendix E: Checking publication bias by funnel plot of all studies and SROC Curve for Sarcopenia Screening tools according to kind of tool

Appendix F: Checking heterogeneity and inconsistency of all screening tools by forest plot

Appendix G: Checking heterogeneity and inconsistency of all screening tools by forest plot in Europe and South America

Appendix H: Checking heterogeneity and inconsistency of all screening tools by forest plot in Asia

Appendix I: GRADE framework Assessment of the Certainty of Diagnostic Accuracy for sarcopenia screening tools

Appendix A: Search terms (based on the elements of the PIRD)

Main keywords	**Relevant keywords**	**Final keywords search**	**MeSH term and Syntax**
Population (P)	- Elderly - Senior - Geriatric - Older - Retirees - Pensioners - Gerontological	Elderly OR Senior OR Geriatric OR Older OR Retirees OR Pensioners OR Gerontological	- Aged[MeSH] - Elderly *[TIAB] - Older*[TIAB] - Senior*[tw] - Geriatric*[tw] - Older*[tw] - Retirees*[tw] - Pensioners*[tw] - Gerontological*[tw] (1) Aged[MeSH] OR "Elderly*"[TIAB] OR "Older*"[TIAB] OR "Senior*"[tw] OR "Geriatric*"[tw] OR "Older*"[tw] OR "Retirees*"[tw] OR "Pensioners*"[tw] OR "Gerontological*"[tw]
Index Test (I)	- sarcopenia screening tool - SPSM - MSRA - Ishii score -SARC-F - SARC-CalF	Screening tool OR SPSM OR MSRA OR Ishii score OR SARC-F OR SARC-F-EBM OR SARC-	- Screen*[TIAB] - SPSM[tw] - MSRA[tw] - Ishii score[tw] -SARC-F[tw] - SARC-CalF[tw] - SARC-F-EBM[tw]

	- SARC-F-EBM - U-TEST - SarSA-Mod - SARCO-GS	CalF OR U-TEST OR SarSA-Mod OR SARCO-GS	- U-TEST[tw] - SarSA-Mod[tw] - SARCO-GS[tw] (2) Screen*[TIAB] OR SPSM[tw] OR MSRA[tw] OR Ishii score[tw] OR SARC-F[tw] OR SARC-CalF[tw] OR SARC-F-EBM[tw] OR U-TEST[tw] OR SarSA-Mod[tw] OR SARCO-GS[tw]
Reference Standard (R)	- Sarcopenia - AWGS - EWGSOP - IWGS - FNIH	Sarcopenia OR AWGS OR EWGSOP OR IWGS OR FNIH	-Sarcopenia[MeSH] -Sarcopenia[TIAB] - AWGS[tw] - EWGSOP[tw] - IWGS[tw] (3) Sarcopenia[MeSH] OR Sarcopenia[TIAB] OR AWGS[tw] OR EWGSOP[tw] OR IWGS[tw] OR FNIH[tw]
Diagnostic Accuracy (D)	- Sensitivity - Specificity - Likelihood Ratios - ROC Curves - AUC	Sensitivity OR Specificity OR Possitive Likelihood Ratios OR negative Likelihood Ratios OR "ROC Curves" OR AUC	- Sensiti*[tw] - Specific*[tw] - Likelihood Ratios*[tw] - ROC Curves*[tw] - AUC[tw] (4) Sensiti*[tw] OR Specific*[tw] OR Likelihood Ratios*[tw] OR ROC Curves*[tw] OR AUC[tw]

Keyword search: (1) AND (2) AND (3) AND (4)

Medline search: (1) AND (2) AND (3) AND (4)

Appendix B: Database search strategies

Platform	**Search command**
Scopus	TITLE-ABS-KEY((Elderly OR Senior OR Geriatric OR Older OR Retirees OR Pensioners OR Gerontological) AND ("Screening tool" OR SPSM OR MSRA OR "Ishii score" OR "SARC-F" OR "SARC-F-EBM" OR "SARC-CalF" OR "U-TEST" OR "SarSA-Mod" OR "SARCO-GS") AND (Sarcopenia OR AWGS OR EWGSOP OR IWGS OR FNIH) AND (Sensitivity OR Specificity OR "Positive Likelihood Ratios" OR "Negative Likelihood Ratios" OR "ROC Curves" OR AUC))
PubMed	(((Sarcopenia[MeSH] OR Sarcopenia[TIAB] OR AWGS[tw] OR EWGSOP[tw] OR IWGS[tw]) AND (Screen*[TIAB] OR SPSM[tw] OR MSRA[tw] OR Ishii score[tw] OR SARC-F[tw] OR SARC-CalF[tw] OR SARC-F-EBM[tw] OR U-TEST[tw] OR SarSA-Mod[tw] OR SARCO-

	GS[tw])) AND (Sensiti*[tw] OR Specific*[tw] OR Likelihood Ratios*[tw] OR ROC Curves*[tw] OR AUROC[tw])) AND (Aged[MeSH] OR "Elderly*"[TIAB] OR "Older*"[TIAB] OR "Senior*"[tw] OR "Geriatric*"[tw] OR "Older*"[tw] OR "Retirees*"[tw] OR "Pensioners*"[tw] OR "Gerontological*"[tw])
ResearchGate	(Elderly OR Senior OR Geriatric OR Older OR Retirees OR Pensioners OR Gerontological) AND ("Screening tool" OR SPSM OR MSRA OR "Ishii score" OR "SARC-F" OR "SARC-F-EBM" OR "SARC-CalF" OR "U-TEST" OR "SarSA-Mod" OR "SARCO-GS") AND (Sarcopenia OR AWGS OR EWGSOP OR IWGS OR FNIH) AND (Sensitivity OR Specificity OR "Positive Likelihood Ratios" OR "Negative Likelihood Ratios" OR "ROC Curves" OR AUC)
Embase	(((exp sarcopenia/ OR sarcopenia:ti,ab,kw OR AWGS:ti,ab,kw OR EWGSOP:ti,ab,kw OR IWGS:ti,ab,kw) AND (screen*:ti,ab,kw OR SPSM:ti,ab,kw OR MSRA:ti,ab,kw OR "Ishii score":ti,ab,kw OR "SARC-F":ti,ab,kw OR "SARC-CalF":ti,ab,kw OR "SARC-F-EBM":ti,ab,kw OR "U-TEST":ti,ab,kw OR "SarSA-Mod":ti,ab,kw OR "SARCO-GS":ti,ab,kw)) AND (sensiti*:ti,ab,kw OR specific*:ti,ab,kw OR "Likelihood Ratios":ti,ab,kw OR "ROC Curves":ti,ab,kw OR AUROC:ti,ab,kw)) AND (exp aged/ OR elderly:ti,ab,kw OR older:ti,ab,kw OR senior:ti,ab,kw OR geriatric:ti,ab,kw OR retirees:ti,ab,kw OR pensioners:ti,ab,kw OR gerontological:ti,ab,kw))
Google Scholar	(Elderly OR Senior OR Geriatric OR Older OR Retirees OR Pensioners OR Gerontological) AND ("Screening tool" OR SPSM OR MSRA OR "Ishii score" OR "SARC-F" OR "SARC-F-EBM" OR "SARC-CalF" OR "U-TEST" OR "SarSA-Mod" OR "SARCO-GS") AND (Sarcopenia OR AWGS OR EWGSOP OR IWGS OR FNIH) AND (Sensitivity OR Specificity OR "Positive Likelihood Ratios" OR "Negative Likelihood Ratios" OR "ROC Curves" OR AUC)

Appendix C: List of excluded studies with reasons

Data sources	**Database**	**Pubmed**	**Embase**	**Google Scholar**	**ResearchGate**	**Scopus**	**Total**
	Date search	20/02/2024	2/2/2024	20/02/2024	20/02/2024	20/02/2024	
Title rejected	Total	331	242	8660	100	262	**9595**

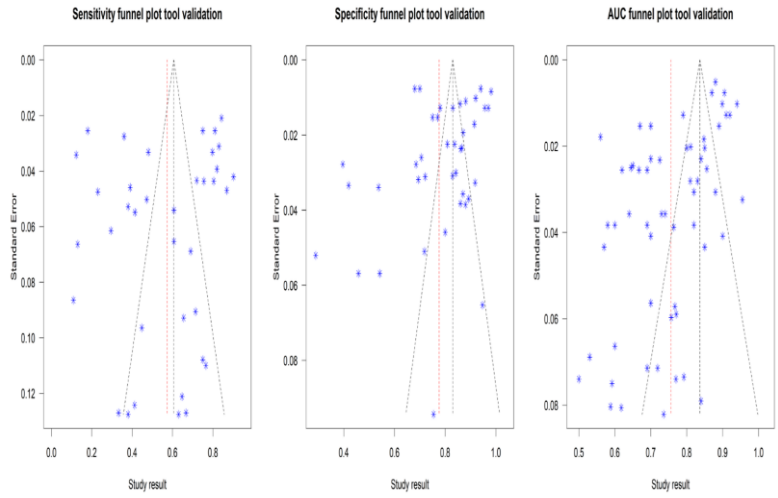
	not sarco						**9**
	not dwelling elderly						**2**
	not any tools						**7** **4**
	dublicate						**1** **6** **8**
	Read abstract						**1** **5** **3**
Abstract reject	stu (wrong study type)						
	pub (Wrong publication type)						
	pop (wrong population)						
	int (wrong intervention or no intervetnion)						
	out (wrong outcome)						**7**
	Abs. rejected						**4**
	Abs. remaining						**7** **9**
Fulltext screening results	Not diagnostic accuracy (not enough information)						**8**
	Dublicate						**2**
	Not community, not sarcopenia						**1** **5**
	Only 1 study could not do meta analysis						**1** **2**
	Unable to download fulltext (only Abstract or Poster)						**1** **0**
	Articles rejected						**4** **7**
	Articles remaining						**3** **2**
	Articles included						**3** **2**

Appendix D: Check bias by COSMIN Checklist

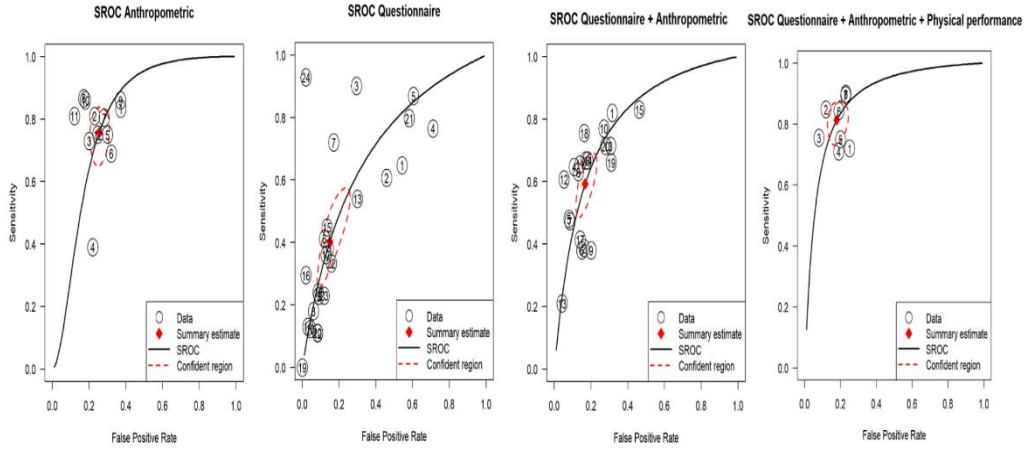
Scale	**Content validity**	**Structural validity**	**Reliability**	**Internal consistency**	**Cross-cultural validity**	**Criterion validity**
Calf circumference (9 studies)	Not reported	Not reported	Not reported	Not reported	Excellent	Excellent

MSRA5 (3 studies)	Not reported	Not reported	Not reported	Not reported	Excellent	Excellent
MSRA7 (2 studies)	Not reported	Not reported	Not reported	Not reported	Excellent	Excellent
SARC-F (19 studies)	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
SARC-F + AC (3 studies)	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
SARC-Calf (14 studies)	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
SARC-Calf + AC (3 studies)	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
Ishii (5 studies)	Not reported	Not reported	Not reported	Not reported	Excellent	Excellent

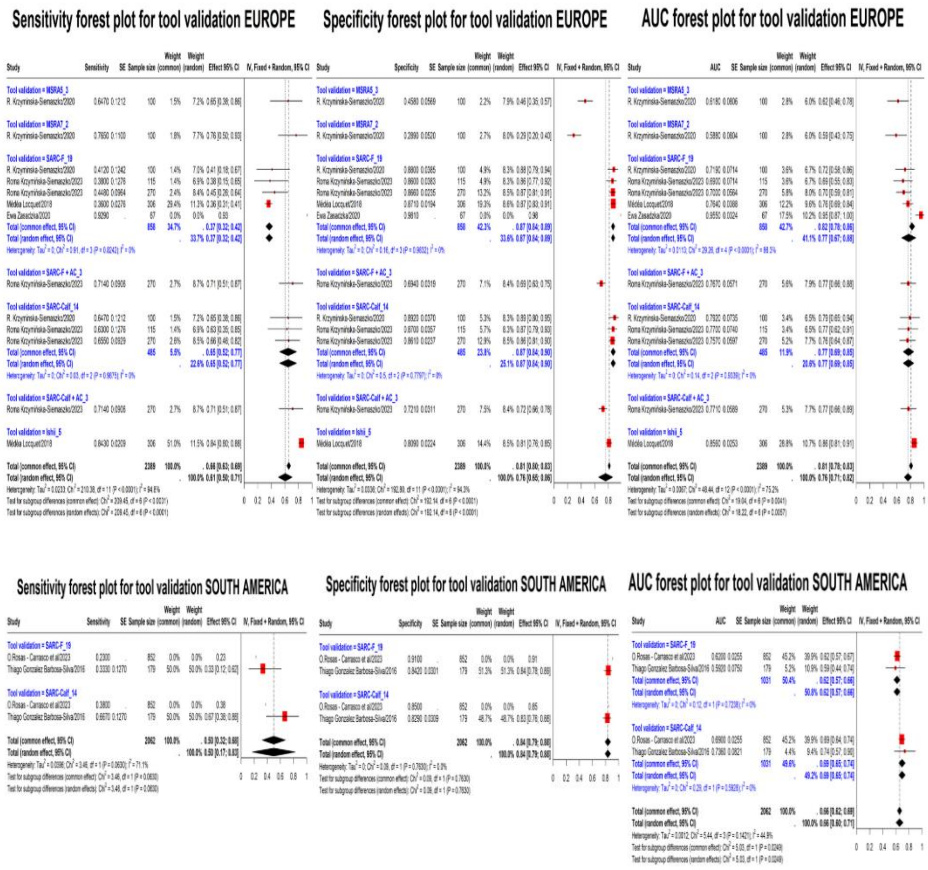
We chose the best results for analysis in this section



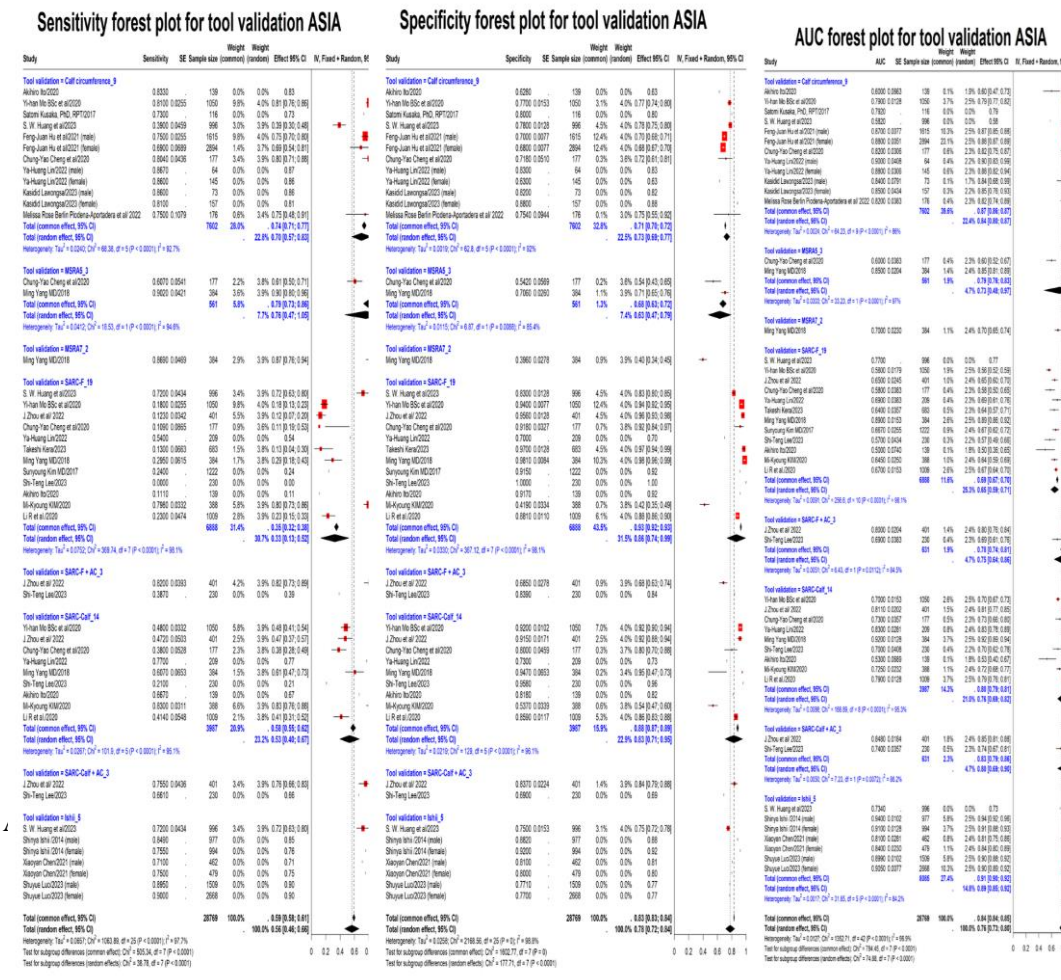
Appendix E$_a$. Checking publication bias by funnel plot of all studies



Appendix E$_b$. The SROC Curve for Sarcopenia Screening tools according to kind of tool



Appendix G: Checking heterogeneity and inconsistency of all screening tools by forest plot in Europe and South America



Appendix H: Checking heterogeneity and inconsistency of all screening tools by forest plot in Asia

Screening Tool	Outcome	Quantity and Type of Evidence	Findings (%)	Starting Grade	Decrease GRADE (Risk of Bias, Consistency, Directness, Precision, Publication Bias)	GRADE of Evidence for Outcome	Overall GRADE
Calf circumference	Sensitivity	9 DIAG	70%	High	-1 (concistency)	-1	Moderate
	Specificity	9 DIAG	73%	High	-1 (concistency)	-1	Moderate
	PPV	9 DIAG	0.48	High	-1 (concistency)	-1	Moderate
	NPV	9 DIAG	0.91	High	-1 (concistency)	-1	Moderate
MSRA5	Sensitivity	3 DIAG	73%	High	-2 (risk of bias, concistency)	-2	Low
	Specificity	3 DIAG	58%	High	-2 (risk of bias, concistency)	-2	Low
	PPV	3 DIAG	0.39	High	-2 (risk of bias, concistency)	-2	Low
	NPV	3 DIAG	0.8	High	-2 (risk of bias, concistency)	-2	Low
MSRA7	Sensitivity	2 DIAG	85%	High	-1 (risk of bias)	-1	Moderate
	Specificity	2 DIAG	35%	High	-1 (risk of bias)	-1	Moderate
	PPV	2 DIAG	0.2	High	-1 (risk of bias)	-1	Moderate
	NPV	2 DIAG	0.9	High	-1 (risk of bias)	-1	Moderate
SARC-F	Sensitivity	19 DIAG	35%	High	-1 (concistency)	-1	Moderate
	Specificity	19 DIAG	76%	High	-1 (concistency)	-1	Moderate

	PPV	19 DIAG	0.44	High	-1 (concistency)	-1	Moderate
	NPV	19 DIAG	0.82	High	-1 (concistency)	-1	Moderate
SARC-F + AC	Sensitivity	3 DIAG	80%	High	0	0	High
	Specificity	3 DIAG	69%	High	0	0	High
	PPV	3 DIAG	0.44	High	0	0	High
	NPV	3 DIAG	0.82	High	0	0	High
SARC-Calf	Sensitivity	14 DIAG	57%	High	-1 (concistency)	-1	Moderate
	Specificity	14 DIAG	84%	High	-1 (concistency)	-1	Moderate
	PPV	14 DIAG	0.54	High	-1 (concistency)	-1	Moderate
	NPV	14 DIAG	0.84	High	-1 (concistency)	-1	Moderate
SARC-Calf + AC	Sensitivity	3 DIAG	75%	High	0	0	High
	Specificity	3 DIAG	78%	High	-1 (concistency)	-1	Moderate
	PPV	3 DIAG	0.44	High	-1 (concistency)	-1	Moderate
	NPV	3 DIAG	0.9	High	-1 (concistency)	-1	Moderate
Ishii	Sensitivity	5 DIAG	79%	High	-1 (risk of bias)	-1	Moderate
	Specificity	5 DIAG	78%	High	-1 (risk of bias)	-1	Moderate
	PPV	5 DIAG	0.46	High	-1 (risk of bias)	-1	Moderate
	NPV	5 DIAG	0.95	High	-1 (risk of bias)	-1	Moderate

Appendix I: GRADE Framework Assessment of the Certainty of Diagnostic Accuracy For Sarcopenia Screening Tool