Postprint: A Systematic Review of Psychological Resilience Assessment Instruments for Cancer Patients Based on COSMIN Guidelines

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Abstract

Background Assessment of psychological resilience can help understand the process by which patients utilize internal and external resources to adjust and adapt when facing major life stressors such as adversity and trauma, as well as issues related to disease treatment. Currently, scales available domestically and internationally for assessing cancer-related psychological resilience are mostly self-report in format and diverse in category; however, there is currently no gold standard for measuring cancer psychological resilience. Systematic and standardized integration and evaluation of the psychometric properties of such scales are still lacking, making it relatively difficult to select assessment tools in a reasonable and standardized manner.

Purpose To systematically evaluate the measurement properties and methodological quality of studies on psychological resilience assessment tools for cancer patients, and to provide a reference for medical staff in selecting high-quality assessment tools.

Methods A systematic search was conducted for Chinese and English literature related to the evaluation of measurement properties of cancer psychological resilience scales in PubMed, Embase, Web of Science, Cochrane Library, CINAHL, CNKI, VIP, Chinese Biomedical Literature Database, and Wanfang Data Knowledge Service Platform, with the search period from database inception to February 14, 2023. Two researchers independently screened literature and extracted data. Based on the Consensus-based Standards for the Selection of Health Measurement Instruments (COSMIN) systematic review guideline, a risk of bias checklist and quality criteria rating scale were used to evaluate measurement properties and formulate final recommendations.

Results A total of 13 studies were included, encompassing 9 cancer psychological resilience instruments: the 10-item Connor-Davidson Resilience Scale (CD-RISC-10), Resilience Scale for Cancer (RS-SC), 10-item Short Resilience Scale for Cancer (RS-SC-10), 14-item Resilience Scale (RS-14), Brief Resilient Coping Scale (BRCS), SV-RES Resilience Scale (SV-RES), Revised Ego Resiliency Scale (ER89-R12), Pain Resilience Scale (PRS), and Shift-Persist Questionnaire (SPQ). None of the studies reported responsiveness or measurement error of the assessment tools. Due to uncertain content validity and evidence quality rated as high or below, eight scales received a Grade B recommendation; because of insufficient cross-cultural validity with high-quality evidence, RS-SC-10 received a Grade C recommendation.

Conclusion The measurement properties of the psychological resilience assessment tools included in this study were all imperfect. Compared with the other eight scales, the RS-SC had more comprehensive evaluation of measurement properties and better reliability and validity, and may be provisionally recommended for use, but requires further in-depth validation.

Full Text

Introduction

In 2020, approximately 19.3 million new cancer cases and 10 million cancer-related deaths occurred globally, making cancer the leading cause of morbidity and mortality worldwide and a major contributor to the global health burden [1]. China accounts for one-quarter of global cancer cases and deaths, with these numbers continuing to rise, highlighting the urgent need to address the high burden of cancer in the country [1-2]. Cancer diagnosis and treatment represent "intense and persistent stressors" for patients [3], who consequently experience various negative psychological reactions including anxiety, depression, and hopelessness [4-6]. Psychological resilience refers to the process by which individuals utilize internal and external resources to adapt and cope effectively when facing adversities, traumas, significant life stressors, and disease treatment [7-8]. At the individual level, high levels of psychological resilience help cancer patients enhance their psychological adaptability, reduce negative emotions [9-10], and maintain an optimistic attitude toward disease treatment, thereby improving quality of life [10-13]. At the societal level, improved psychological resilience among cancer patients can reduce the burden and costs of clinical care. Psychological resilience is quantifiable, and numerous scales have been developed globally to measure it. However, no gold standard currently exists for measuring psychological resilience specifically in cancer patients. Clinically, the Resilience Scale and Connor-Davidson Resilience Scale are primarily used, but literature reviews reveal that these scales were originally developed for non-cancer populations and have not undergone standardized validation in cancer populations, raising questions about their accuracy in assessing true psychological resilience levels in cancer patients [14]. Scientific, rational, and standardized assessment

tools are the cornerstone of quantitative research, and appropriate tool selection is a critical step in continuing research on psychological resilience in cancer patients.

Given the wide variety of scales available for assessing psychological resilience in cancer patients—most of which are self-report measures—and the lack of systematic evaluation of their measurement performance in clinical application, it is necessary to conduct a systematic review of the measurement properties of these tools. The Consensus-based Standards for the Selection of Health Measurement Instruments (COSMIN) is an expert consensus-based guideline for selecting patient-reported outcome measures [15]. It recommends standardized methods for developing systematic reviews of patient-reported outcome measures (PROMs) and offers advantages in guiding clinicians and researchers to select appropriate patient self-report scales by evaluating methodological quality and measurement properties to identify high-quality tools aligned with research objectives.

Based on these guidelines, this study identified, compared, and critically evaluated existing psychological resilience assessment tools for cancer patients, recommended scientifically reliable high-quality instruments, established a foundation for effective clinical assessment of psychological resilience in cancer patients, provided references for monitoring patient mental health, and offered evidence-based guidance for future clinical research and targeted tool development and validation in this domain.

Methods

1.1 Inclusion and Exclusion Criteria

Inclusion criteria: (1) Study population: cancer patients; (2) Study content: evaluation of measurement properties of psychological resilience scales; (3) At least one measurement property of the tool was evaluated; (4) Language: Chinese or English.

Exclusion criteria: (1) Scales applicable only to a specific cancer type; (2) Scales used solely for measuring outcome indicators; (3) Secondary analyses such as reviews and systematic reviews; (4) Full-text unavailable.

1.2 Search Strategy

We systematically searched PubMed, Embase, Web of Science, Cochrane Library, CINAHL, CNKI, VIP, CBM, and Wanfang Data, with the search period from database inception to February 14, 2023. We also manually reviewed reference lists of included studies. The search combined subject headings and free-text terms. Chinese search terms included: "cancer/tumor," "psychological resilience/mental resilience/recovery force/psychological resistance," and "scale/questionnaire/tool/reliability/validity." English search terms included: "neoplasms/cancer/tumor/carcinoma/oncology," "resilience, psychologi-

cal/psychological resilience/psychological resiliency/resilience/resiliency/resilient," and "assessment/evaluation/instrument/questionnaire/measurement/tool/scale." The PubMed search strategy is detailed in Table 1 .

1.3 Literature Screening and Data Extraction

Two researchers independently screened literature and extracted data according to the search strategy and inclusion/exclusion criteria. Data extraction included: first author, publication year, scale name, study region, target population, sample size, scale dimensions/number of items, scoring method, and seven types of measurement properties [16]. Discrepancies were resolved through discussion or by consulting a third reviewer.

1.4 Evaluation Methods

1.4.1 Evaluation Procedure Following COSMIN guidelines [16], two trained researchers independently evaluated the studies, with disagreements resolved by a third reviewer. First, the COSMIN Risk of Bias checklist [17] was used to assess methodological quality. Second, COSMIN quality criteria [18] were applied to evaluate measurement properties. Finally, the modified GRADE approach [19] was used to synthesize evidence levels for each measurement property and provide corresponding recommendations.

1.4.2 Evaluation Tools 1.4.2.1 Methodological Quality Assessment: The COSMIN Risk of Bias checklist [17] was used, comprising 10 modules covering PROM development, content validity, structural validity, internal consistency, cross-cultural validity, stability, measurement error, criterion validity, hypothesis testing, and responsiveness. Each item was rated as "very good (V)," "adequate (A)," "doubtful (D)," or "inadequate (I)," with the lowest rating within a module determining the final score.

1.4.2.2 Measurement Property Quality Assessment: COSMIN quality criteria [18] were used to evaluate three aspects of measurement properties: validity, reliability, and responsiveness, including content validity, structural validity, internal consistency, cross-cultural validity/measurement invariance, stability, measurement error, criterion validity, hypothesis testing, and responsiveness. Each property was rated as "sufficient (+)," "insufficient (-)," or "uncertain (?)."

1.4.2.3 Evidence Grading and Recommendations: The modified GRADE method [19] was used to summarize measurement properties and assign recommendation strength. Starting at "high quality," evidence was downgraded based on four factors: risk of bias, inconsistency, imprecision, and indirectness, resulting in four final grades: "high," "moderate," "low," or "very low." Final recommendations were classified as: Class A (recommended) for scales with sufficient content validity (+) and internal consistency (+); Class B (not Class A or C,

showing potential but requiring further research); or Class C (not recommended) when high-quality evidence shows insufficient content validity (-) [20].

Results

2.1 Study Selection

The search yielded 3,088 articles, with 2 additional articles identified through reference tracking. After removing 869 duplicates, 2,221 articles remained. Title and abstract screening excluded 2,048 articles, and full-text review excluded another 158, leaving 15 articles [21-35] comprising 13 studies for inclusion. The literature screening flow chart is shown in Figure 1 [Figure 1: see original paper].

2.2 Characteristics of Included Studies

The 13 studies [21-35] evaluated nine psychological resilience scales: 10-item Connor-Davidson Resilience Scale (CD-RISC-10), Resilience Scale Specific to Cancer (RS-SC), 10-item Resilience Scale Specific to Cancer (RS-SC-10), 14-item Resilience Scale (RS-14), Brief Resilient Coping Scale (BRCS), SV-RES Resilience Scale (SV-RES), Revised Ego-Resiliency Scale (ER89-R12), Pain Resilience Scale (PRS), and Shift and Persist Questionnaire (SPQ). None of the studies reported on responsiveness or measurement error. Detailed characteristics are provided in Table 2 .

2.3 Evaluation of Measurement Properties

2.3.1 Instrument Development All 13 studies [21-35] clearly described the measured construct and theoretical model. Nine studies [21-22,25-28,30-31,33,35] reported insufficient information on relevance, comprehensiveness, and comprehensibility of scale development, receiving "doubtful"methodological quality ratings. Four studies [23-24,29,32,34] conducted detailed qualitative and quantitative research, receiving "adequate" ratings.

2.3.2 Validity 2.3.2.1 Content Validity: Five studies [21,23-24,29,32,34] reported content validity. Three studies [23-24,32,34] used expert consultation, with two of these [32,34] also surveying patients about relevance, comprehensiveness, and comprehensibility. The remaining two studies [21,29] only reported patient evaluations of relevance or comprehensibility. Except for one study [23-24] that used both qualitative interviews and quantitative surveys with detailed reporting (rated "adequate"), the others [21,29,32,34] had insufficient methodological detail and were rated "doubtful,"resulting in "uncertain"content validity.

2.3.2.2 Structural Validity: All 13 studies conducted exploratory and/or confirmatory factor analysis (CFA). Ten studies [21-27,29,31,33-35] used CFA, with six [21,27,29,31,33,35] showing fit indices >0.95 and adequate sample sizes, receiving "very good" methodological quality ratings and "sufficient" structural validity. One study [32] was rated "inadequate" due to insufficient sample size.

Four studies [22-26,29] used item response theory (IRT), while the rest used classical test theory (CTT).

2.3.2.3 Criterion Validity: According to COSMIN guidelines, the original scale can serve as the gold standard for evaluating short-form versions [16]. Only one study [23-24] reported criterion validity, but it did not follow guideline requirements, resulting in "inadequate" methodological quality and "insufficient" criterion validity.

2.3.3 Reliability 2.3.3.1 Internal Consistency: Eleven studies [21-24,27-31,33-35] reported internal consistency for all dimensions, with Cronbach' s α coefficients >0.7, receiving "very good" methodological quality ratings and "sufficient" internal consistency. One study [32] only calculated Cronbach' s α for the total scale rather than individual dimensions, receiving an "inadequate" rating. One study [25-26] did not report Cronbach' s α.

2.3.3.2 Stability: Five studies [22-24,28-30] assessed stability. Three studies [28-30] did not clearly report appropriate time intervals, while two [22-24] reported correlation coefficients without calculating intraclass correlation coefficients (ICC), resulting in "doubtful" methodological quality. One study [29] reported ICC>0.7 (sufficient stability), while two others [28,30] reported some ICC values <0.7 (uncertain stability).

2.3.3.3 Cross-Cultural Validity/Measurement Invariance: Five studies [22-26,29,33] evaluated cross-cultural validity/measurement invariance. Four used differential item functioning (DIF) analysis [22-26,29], and one used multigroup CFA (MGCFA) [33]. Three studies [22-24,29] were rated "doubtful" due to unclear reporting of similarity in relevant variables other than grouping variables. One study [25-26] was rated "adequate" due to one group having <200 participants, and another was "very good." Three studies [22-26] showed DIF, indicating "insufficient" measurement properties.

2.3.4 Hypothesis Testing Seven studies [21-24,29,31,33,35] conducted hypothesis testing. One [22] was rated "doubtful" for not describing subgroup characteristics. Two [21,31] were rated "adequate" due to unclear measurement properties of comparison scales in the study population. Four [23-24,29,33,35] were "very good." Three studies [21-22,31] had unclear hypotheses for scale comparisons (insufficient hypothesis testing), while four [23-24,29,33,35] showed sufficient results.

2.4 Evidence Grading and Recommendations

Measurement properties were integrated across studies and downgraded from four aspects, as detailed in Table 4 . For risk of bias: RS-SC-10, BRCS, ER89-R12, and SPQ had "not reported" content validity; RS-SC had "adequate" content validity requiring no downgrade; the other five scales were "doubtful" and downgraded by one level. SV-RES had "inadequate" structural validity

(downgraded by two levels), while the other nine scales were "very good or adequate." RS-SC-10 had "doubtful" internal consistency (downgraded one level), while SV-RES was "inadequate" (downgraded two levels). CD-RISC-10, RS-SC, and RS-14 had "doubtful" cross-cultural validity (downgraded one level). CD-RISC-10, RS-SC, and RS-14 had "doubtful" stability (downgraded one level). RS-SC had "inadequate" criterion validity (downgraded two levels). CD-RISC-10 and BRCS had "doubtful" hypothesis testing (downgraded one level). No scales showed indirectness.

After comprehensive downgrading, eight scales lacked evidence for sufficient content validity and internal consistency, receiving Class B recommendations. RS-SC-10 received a Class C recommendation due to "insufficient" cross-cultural validity supported by high-quality evidence.

Discussion

3.1 Urgent Need for Comprehensive Improvement in Methodological Quality and Measurement Properties of Cancer Resilience Scales

3.1.1 Content Validity Reporting Is Often Neglected and Incomplete Content validity, which evaluates relevance, comprehensiveness, and comprehensibility, is the most important measurement property [36]. However, reporting of content validity in included studies was incomplete and non-standardized. Only five of the 13 studies [21,23-24,29,32,34] reported content validity. When localizing the RS-14 scale, MIROŠEVIČ et al. [29] conducted no qualitative research, only pre-testing comprehensibility. ALARCÓN et al. [21] interviewed cancer patients when applying the CD-RISC-10 but reported no data analysis details. DURAND-ARIAS et al. [32] conducted focus groups with experts and patients when localizing SV-RES but provided no details beyond participant numbers. GHAZIPOOR et al. [34] consulted only four psychology professors when applying PRS to cancer patients, failing to meet COSMIN qualitative sample size requirements. YE et al. [23-24] provided detailed descriptions of professional researcher design and data analysis when developing RS-SC but lacked clarity on patient interview design and analysis. We recommend that future scale development or adaptation combine qualitative interviews with quantitative surveys, incorporate input from both patients and professionals, and follow COSMIN guidelines for research design. Cognitive interviewing could also be added to understand patient perspectives and enhance construct representation and item appropriateness.

3.1.2 Cross-Cultural Validity Testing Is Lacking and Inadequately Reported Evaluating measurement invariance or differential item functioning is the primary method for assessing cross-cultural validity [37]. Only five of the 13 studies [22-26,29,33] evaluated cross-cultural validity, with four calculating DIF. Three studies [22-24,29] received "doubtful" ratings due to unclear reporting of similarity in relevant variables beyond grouping variables. YE et al. [25-26] applied RS-SC-10 to American and Chinese cultural groups but failed to meet

COSMIN sample size requirements for one group, preventing a "very good"rating. Future research should conduct cross-cultural validity testing and DIF analysis when developing or adapting scales, ensure comparability of variables across groups, select adequate sample sizes per COSMIN guidelines, and standardize reporting.

3.1.3 Stability Assessment Is Limited and Retest Design Lacks Rigor Stability encompasses test-retest reliability, intra-rater reliability, and inter-rater reliability [38]. Only five studies [22-24,28-30] assessed stability, and all evaluated only test-retest reliability, potentially introducing bias. Two studies lacked clarity on measurement context similarity or ICC calculation. TIAN et al. [28], MIROŠEVIČ et al. [29], and HASHIM et al. [30] used RS-14 with retest intervals of 1 week, 7-10 days, and 3-7 days respectively, all deviating from COSMIN' s recommended 2-week interval without justification. Future studies should emphasize rigorous design, demonstrate construct stability and context similarity [38], select appropriate intervals based on construct and population characteristics, and report appropriate statistics for different data types.

3.1.4 Criterion Validity Testing Is Absent with Inappropriate "Gold Standards" Criterion validity reflects how well a tool captures the "gold standard" [38]. No gold standard exists for cancer resilience scales. COSMIN permits using the original scale as a gold standard for short-form versions. Only one study [23-24] reported criterion validity, but it selected the most widely used tool rather than following guidelines. Several short-form development studies [25-26] omitted criterion validity testing entirely. Future research should supplement criterion validity assessment with appropriate gold standard selection.

3.1.5 Incomplete Reporting of Measurement Properties None of the 13 studies evaluated measurement error or responsiveness. Measurement error includes systematic and random error [38], while responsiveness reflects scale sensitivity. Future studies should reference COSMIN guidelines to complete evaluation of these properties.

3.2 Development and Application Populations Vary; Targeted Tools Require Further Development

Beyond measurement properties, development and target populations warrant attention. Among the nine scales, only RS-SC was developed specifically for cancer patients, with RS-SC-10 derived from it. The other seven tools were originally developed for adolescents, college students, adults, older adults, or PTSD patients before being adapted for cancer populations. While these adapted scales demonstrate adequate reliability and validity, they lack cancer-specific characteristics. Future tool selection should consider population-specific needs.

3.3 Selection and Recommendation of Cancer Resilience Scales

This systematic review resulted in eight Class B recommendations and one Class C recommendation. RS-SC demonstrated the most comprehensive measurement property evaluation. Except for measurement error and responsiveness (unassessed in all studies), RS-SC showed evidence for all other properties, with high-quality evidence supporting its content validity, structural validity, internal consistency, and hypothesis testing. The scale was specifically developed for cancer patients based on Traditional Chinese Medicine temperament theory and the Shift-Persist model, comprising five dimensions: non-specific resilience components, disease benefit, support and coping, future hope, and meaning in existence. These dimensions reflect the process by which cancer patients utilize resources to adapt to adversity, trauma, and disease treatment. Given its cancer-specific focus, appropriate item count, and high sensitivity, RS-SC can serve as an effective clinical measurement tool with good specificity and clinical applicability, providing evidence-based guidance for assessing psychological resilience in cancer patients. RS-SC may be temporarily recommended, but its measurement properties require further validation.

This systematic review evaluated cancer resilience assessment tools using COSMIN guidelines, revealing uneven methodological quality and incomplete measurement properties. After comprehensive consideration, RS-SC is temporarily recommended as the most robust instrument. Future research should improve existing scales per COSMIN standards or develop more targeted, high-quality tools to support scientific assessment and clinical practice. This review has limitations: some tools had limited evaluations, and only Chinese and English literature was included, which may affect evidence reliability.

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Conflict of Interest: None declared.

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Note: Figure translations are in progress. See original paper for figures.