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A critical evaluation of adolescent resilience self-report scales: A scoping review

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Abstract

Valid quantitative measures of adolescent resilience are important for the development of knowledge and have implications for practice with adolescents. This scoping review followed Arksey and O'Malley's (2005) five step process and aimed to (1) identify the most used self-report scales that measure resilience of adolescents in studies published between 2000 and 2021, (2) describe the scales' psychometric properties, (3) describe the scales' conceptual and theoretical formulations, and (4) assess the scales' relative strengths, weaknesses, and adequacy. A review of 118 papers revealed six commonly used scales. A construct validation approach adapted from Skinner (1981) and expanding on Pangallo et al., (2015), with evidence assessed in four stages (theoretical formulation, reliability, validity, and application) was utilised to critically evaluate the six scales. The results showed that the most adequate scale for measuring resilience in adolescent populations was the Child and Youth Resilience Measure, scoring 83% of points. The Connor-Davidson Resilience Scale (also scoring 83%) and The Resiliency Scales for Children and Adolescents (78%) were also found to be adequate. This review provides clinicians and researchers with a critical overview of common scales measuring resilience in adolescents, including their underlying theoretical basis. This is vital to ensure the measure chosen is valid and matches the theoretical aims of the research/application. Our review also suggests that too often, researchers fail to look beyond the original validation study when selecting resilience scales, and often fail to analyse and report current psychometric data from the chosen scale.

Keywords: Adolescence, resilience, measurement, self-report, psychometrics, scoping review

1.1 Introduction

Promoting adolescent resilience has the promise to realise positive trajectories for not only youth, but for society (WHO, 2017; Bonnie et al., 2019). One in two adolescents will experience mental health problems at some point in their lives, yet relatively little is known about how resiliency factors can predict or reduce psychological distress (Fritz et al., 2020). There is a well-accepted view of resilience as a dynamic process across the life course, in which internal and external resources are accessed, which result in the positive adaptation by human beings in the face of adversity (Herrman et al., 2011; Luthar et al., 2000; Masten et al., 2021). Over time, resilience researchers and theorists have concluded that resilience is not a one-dimensional generalised global construct, but rather a multi-dimensional context-specific construct (Luthar et al., 1993; Riley & Masten, 2005).

The shift towards a multi-dimensional understanding of resilience has occurred in four waves (Masten et al., 2021). The first wave was largely descriptive research that focused on factors (first the list of individual characteristics, then a growing list of internal and external assets and resources) that indicated “what” mattered for successful adaptation. The second wave explored “how” successful adaptation occurs (processes, or mechanisms of change). The third wave, focused on intervention research, which tested the causal roles of these processes, and resilience pathways. The fourth wave was driven by advances in methodology, and developmental and systems theories (Masten et al., 2021). As a result, the current consensus reflects a conceptualisation of resilience as a “dynamic process characterized by complex interaction between internal and external resources, rather than a static, innate trait” (Seko et al., 2020, p. 262). From a dynamic systems theory perspective, resilience is “the capacity of a dynamic system to withstand or recover from significant threats to its stability, viability or development” (Masten, 2011, p. 494). Kuldass et al. (2021) argue that resilience be viewed through a transactional lens, rather than as a dualistic state (resilience) or trait (resiliency).

1.1.1 Adolescent Resilience

Adolescence is a developmental phase in the life course during which young people face the cumulative impact of life stressors, such as striving for academic achievement, entering the labour force, embracing close friendships, and navigating intimate relationships, as well as broadening their social networks (Bonnie et al., 2019). As young people are exposed to the cumulative effects of adverse experiences from multiple domains, there is an increased risk of engagement in health risk behaviours and exposure to situations that threaten personal safety, which increase their lifelong risk of poorer health outcomes (Slack, et al., 2017). However, the rapid brain changes in adolescence provide an opportunity to ameliorate earlier harmful childhood impacts and to position a young person for a successful transition into adulthood. As such, adolescence is both a period of higher risk for mental health problems but also a period of opportunity for growth and change. Furthermore, adolescents have heightened sensitivity and responsiveness to their environment, which provides for greater reception of targeted resilience interventions (Bonnie et al., 2019). Idiosyncratic explanations of resilience are critical when it comes down to designing interventions (Unger, 2006; Unger & Theron, 2020), and contextual, cultural, life-course, and other dynamics are all influences on which promotive, protective, and process resilience factors are more or less important. For example, the internal and external factors of the Child and Youth Resilience Measure (CYRM) were found to be different in Canadian youth compared to samples of Indigenous youth in New Zealand (Liebenberg et al., 2012; Sanders et al., 2015; Unger & Theron, 2020). The complexity of adolescent resilience reinforces the necessity for a dynamic multi-system developmental approach (Ungar, 2006).

1.1.2 Measuring Adolescent Resilience

Resilience has been conceived as a process by which positive adaption to challenging circumstances and stressors are possible for all human beings (Ong et al., 2009), not only those who have experienced past adversity (Masten, 2011). Understanding resilience as a process adaptation in different populations and contexts is important, as is the

acknowledgement of the inter- and intra-individual differences in how risk and protective factors interact differently, over time and in specific contexts (Fergus & Zimmerman, 2005; Vanderbilt-Adriance & Shaw, 2008). Resilience research has attracted some criticism for a lack of a unified and consistent approach to how resilience is conceptualised (processes versus trait); how it is defined (heterogeneity of adversity; what adaptive behaviour or outcomes might look like); the instability of resilience as a phenomenon; and the way resilience is operationalised (Luther et al., 2000). Together, these complexities and challenges in understanding resilience explain in part the lack of clarity about how resilience factors change across life course transitions, from childhood through adolescence and into adulthood (Kalisch et al., 2017; Köber et al., 2019).

Clinical changes, identified in empirical studies of resilience, provide valid evidence of resilience processes (Zolkoski & Bullock, 2012). However, there is a lack of adolescent specific measures of resilience (Ahern et al., 2006; Brownlee et al., 2013; Dvorsky & Langberg, 2016; Klika & Herrenkohl, 2013; Rudzinski et al., 2017), and measures that reflect the multi-dimensional conceptualisation of resilience (Liu et al., 2017; Rudzinski et al., 2017; Satapathy et al., 2020). Masten (2021) urges researchers in the fourth wave of resilience research to progress the study of resiliency across multiple levels (individual, social, and community) and multiple systems, crossing disciplinary boundaries (including neurobiology) to capture the complex interplays. With a limited number of resilience scales from which to choose, researchers often select a scale without providing a rationale for their choice (Wadi et al., 2020). This is arguably not surprising given the limited robust evidence to support scale selection (Windle et al., 2011). Often, resilience scales developed for adult populations are used to measure resilience in adolescents (Windle et al., 2011), which means that studies fail to adequately capture salient aspects of the constructs in question (Eiser & Morse, 2001; Windle et al., 2011). To strengthen the argument about the validity of scales for use in

different population cohorts and contexts, further psychometric analysis and scale development is required (Streiner & Kottner, 2014). Literature reviews have typically found that psychometric properties of scales are under-reported, with authors often reporting the original psychometric results rather than empirical results from their study and sample (Slaney et al., 2009; Windle et al., 2011). This finding highlights the importance of systematic reviews of resilience scales used in adolescent populations, to examine whether salient domains of resilience are being reliably and validly measured and understood in relation to this age cohort.

There are relatively few systematic reviews of resilience measurement scales (Wadi et al., 2020), which are essential tools for the selection of measures in new studies (Terwee et al., 2007). A preliminary examination of relevant systematic review articles revealed a diversity of approaches to researched populations, contexts, and methods of critical assessment of scales for inclusion in reviews. For example, reviews have taken a general focus on all population ages (Wadi et al., 2020; Windle et al., 2011), or a narrow focus on geographical contexts (Vannest et al., 2019), clinical challenges (Seko et al., 2019), or the psycho-social traumas of sampled populations (Satapathy et al., 2020), and a robust set of criteria to inform an appropriate selection of scales for resilience research (Pangallo et al., 2015; Windle et al., 2011). A 2006 literature review (Ahern et al., 2006) revealed confusion about whether there is a global definition of resilience in adolescence. Recent authors (Masten et al., 2021; Seko et al., 2020; Vannest et al., 2019; Wadi et al., 2020; Windle et al., 2011) call for the development of new multi-dimensional resilience scales for adolescents. Two of the most cited reviews on resilience scales found no scale could be regarded as a “gold standard” (Ahern et al., 2006; Windle et al., 2011), which in part, is explained perhaps by the lack of accepted explicit criteria for what would constitute the adequate measurement properties of a gold standard

resilience scale (Pangallo et al., 2015; Terwee et al., 2007; Vannest et al., 2019; Windle et al., 2011).

In sum, there is a need for a broad review of the recent adolescent resilience research, to provide a more robust analysis of the relative strengths and weaknesses of available scales used to measure resilience in adolescent populations. For clinical and research purposes, such a review would aid in selecting an appropriate measure of the construct for future studies and inform the identification of appropriate target participants and outcome evaluations for resilience promoting interventions. To assist clinicians and researchers, it would be helpful to understand what scales have been used in recent studies, and the characteristics and relative strengths and weaknesses of those scales based on a robust framework of psychometric evidence and theoretical adequacy. A scoping review methodology was selected as there are several characteristics and concepts to assess and present as part of this study (Munn et al., 2018).

1.1.3 Purpose of study

The current scoping review has two parts: part one is a systematic review of the literature (2000 – 2021) to identify the most selected and peer reviewed self-report scales that measure adolescent resilience; and part two is a critical evaluation of the strengths and weakness of those scales. The study aims to answer the following questions:

- 1) What valid self-report scales are most used to measure adolescent resilience?
- 2) What are these measure's characteristics (domains, items, and constructs) and psychometric properties, relevant to adolescent study samples?
- 3) What are the conceptual and theoretical formulations of the scales as relevant to adolescent populations such as adolescent involvement in scale development and item wording?
- 4) What are the relative strengths and weaknesses of the selected and reviewed scales?

1.2 Material and methods

Following Arksey and O'Malley's (2005) five-stage framework, the methodology for this scoping review included (1) identifying the research questions, (2) identifying relevant studies, (3) study selection, (4) charting the data, and (5) collating, summarising, and reporting the results. The systematic review of the literature sought to answer the first research question, identifying the most selected self-report scales. To answer the next two research questions, original and more recent validation studies of these frequently used scales were then investigated to identify scale characteristics (domains, items and constructs), psychometric properties relevant to adolescent study samples, and the conceptual and theoretical formulations of the scales relevant to adolescent population cohorts such as adolescent involvement in scale development and item wording.

1.2.1 Identifying Relevant Studies

Based on these four research questions, the population of interest, key concepts, and the context related were defined and informed the research strategy (Peters et al., 2015). With guidance from an experienced research librarian, an electronic search of three databases (PsycINFO, Cinahl with full text, and Medline with full text databases, via EBSCOHost) and Google Scholar was undertaken. The search strategy was run in PsycINFO first (see appendix A) and was adapted for the others. The following keywords (MM) and Boolean operators (* indicates all alternative endings after it) were used to find studies of interest in the databases. Adolescen* OR Youth OR teen* OR "young people" OR "young person"; MM "Resilience (Psychological)"; and MM "Stress and Coping Measures" OR questionnaire* OR scale OR instrument OR survey, MM "Psychometrics". To ensure a comprehensive count of studies that used the commonly selected scales, Google Scholar searches were undertaken in a secondary search phase ("scale_full_name AND "adolescen*").

1.2.2 Selecting Studies – Sample

Levac et al., (2010) suggest that while comprehensiveness and rigour are important, researchers must be cognisant of limitations of time and the available resource constraints. Given these constraints in our review, the following inclusion and exclusion criteria were applied. To be selected for inclusion, the study needed to have: (a) at least one resilience dependent variable measured by a self-report scale, (b) have a study sample with a mean age between 10 and 19 years, (c) be published between 2020 and 2021, with full English language text available. Finally, the scale had to be reviewed in two or more of the identified systematic reviews of resilience scales (Ahern et al., 2006; Pangallo et al., 2015; Satapathy et al., 2020; Seko et al., 2020; Vannest et al., 2019; Wadi et al., 2016; Windle et al., 2011). Other reviews or validation of the identified scales were excluded. Using this inclusion and exclusion criteria, 118 papers, utilising six different resilience scales, were included in this scoping review, as shown in the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) diagram in Figure 1 (Moher et al., 2009).

1.2.3 Charting the Data – Data Collection

The original and more recent validation studies and scale manuals of the most frequently used resilience scales were examined to obtain and summarise information about each scale's psychometric and content validity, and the frequency of its application in the literature.

1.2.4 Analysis of Instruments and Scales

The analysis was based on reported test evidence following Skinner's construct validity approach (1981), adapted by Pangallo et.al. (2015) and expanded in the current study to include nine assessment criteria. Skinner's (1981) framework included an assessment of adequacy of evidence in three stages: the theoretical formulation; reliability; and validity. The first stage is a theory formulation phase, which investigates the evidence based on test content. In previous reviews there has been calls for more rigorous tests of content reliability, validity, and interpretation (Pangallo et al., 2015; Windle et al., 2011), demonstrated by a

reported involvement of experts and/or representatives of the scale's target population in the process of item development (Terwee et al., 2007). Furthermore, Windle et al., (2011) posit that to operationalise resilience as a dynamic process of adaption to adversity (the adopted definition for this scoping review), the instrument must assess a range of protective mechanisms within multiple domains and at multiple levels. The second stage, reliability evidence, assesses the adequacy of reported internal consistency, reliability, and replicability. The third stage, validity, investigates convergent and discriminant evidence of scores, or in their absence, other criterion evidence. The addition of a fourth stage, application, as found in other reviews (Pangallo et al., 2015; Seko et al., 2019), records how frequently scale appear in reviews as well as research studies, reflective of the current scoping review's objective of mapping commonly used scales.

To summarise each scale's strengths and weaknesses, points were awarded using a 3-point rating scale (Pangallo et al., 2015; Windle et al., 2011) in each of the nine criterion. Evidence is awarded 2 points for fully meeting the criteria, one point for partially satisfying the criteria, and zero points for not providing sufficient information or for not satisfying the criteria, with points summated for each stage of assessment. A cut off score of 14 points out of a possible 18 points (78% agreement with assessment criteria) was considered "adequate", the same standard adopted by other reviews (Pangallo et al., 2015).

1.3 Results

The search as outlined in Figure 1, yielded 2223 articles (91 Cinahl; 1129 Medline; 803 PsychINFO; 200 EBSCOHost and Google Scholar) and after the removal of 494 duplicates this resulted in 1729 article titles and abstracts. A further 1434 articles were excluded if no resiliency scale was used, the study population was not within the adolescent age range, or the paper was a review article. The remaining 295 full articles were retrieved, a further 10 duplicates and 42 validation studies were excluded, leaving 243 articles for review to identify

the most frequently used scales in studies of adolescent populations. A further 125 articles were excluded because the scales used did not feature in more than one review article (Seko et al., 2020) or the scale was not used in more than two other non-validation studies. Of the 29 resiliency scales identified in 243 reviewed articles, only six scales, used in 118 articles.

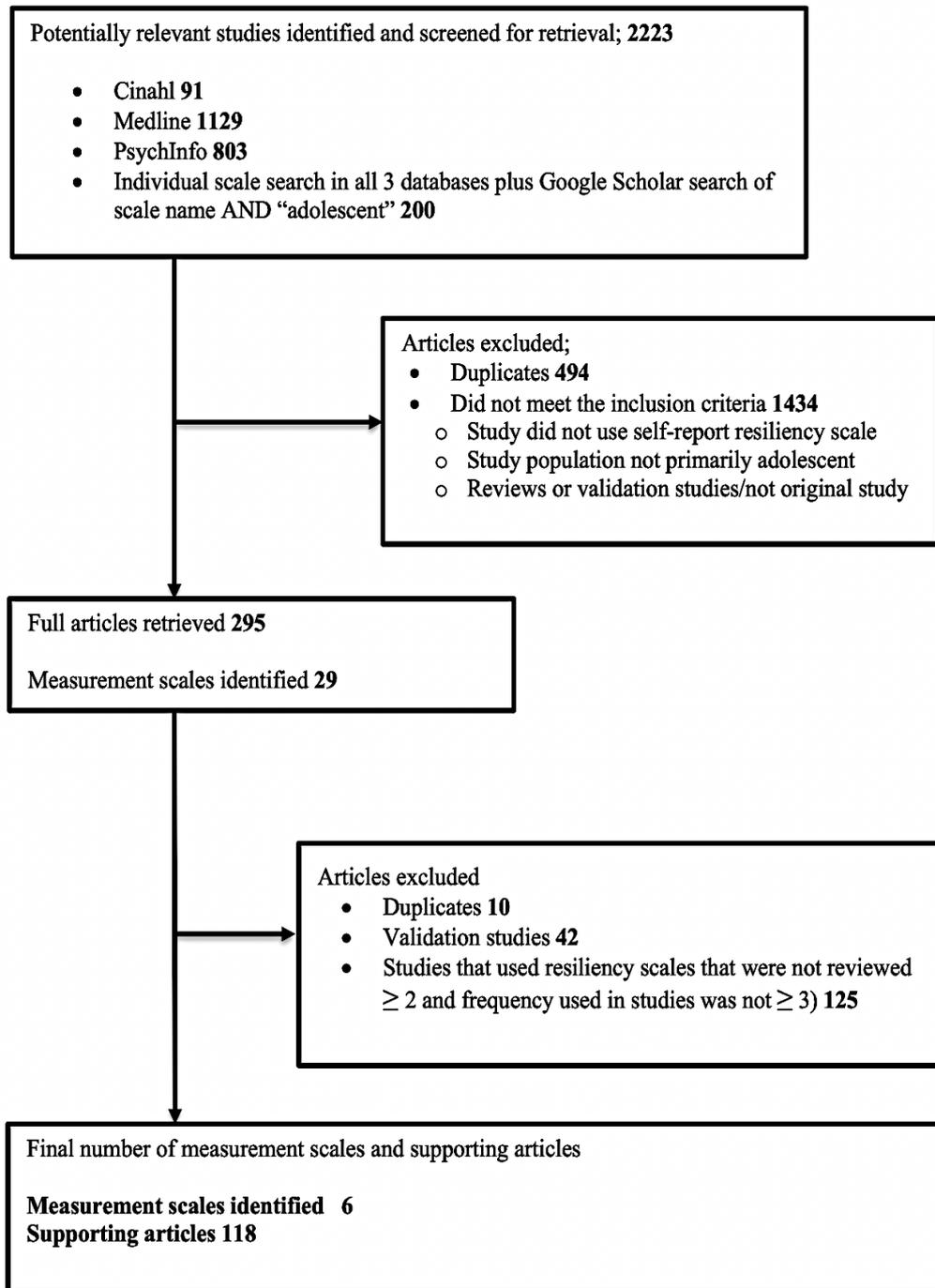
Table 2 provides a summary of the identified scales, which include Connor-Davidson Resilience Scale (CD-RISC; Connor and Davidson, 2003); Resilience Scale (RS-25; Wagnild & Young, 1993); Child and Youth Resilience Measure (CYRM; Unger & Liebenberg, 2011); Resiliency Scales for Children and Adolescents (RSCA; Prince-Embury, 2008); Resilience Scale for Adolescents (READ; Hjemdal et al., 2006); and the Brief Resilience Scale (BRS; Smith et al., 2008).

The most applied scales (frequencies charted in Table 1) each with 35 studies (29.7% of the search results) were RS-25 and CD-RISC – 25, then CYRM with 22 studies (18.6%), RSCA with 16 studies (13.6%), READ with 10 studies (8.5%) and finally the BRS with just four studies (3.4%).

Table 1
Scale Frequency in Reviews, and Frequency in Literature from Scoping Review Search Results

Resilience Scale	Ahern et al., 2006	Windle et al., 2011	Pangallo et al., 2015	Wadi et al., 2016	Vannest et al., 2019	Satapathy et al., 2020	Seko et al., 2020	Total Reviews	Frequency used	% of studies
Connor-Davidson Resilience Scale (CD-RISC)	✓	✓	✓	✓	✓	✓	✓	7	35	29.7%
Resilience Scale (RS-25)	✓	✓	✓	✓	X	✓	✓	6	35	29.7%
Child and Youth Resilience Measure (CYRM)	X	✓	X	✓	✓	✓	✓	5	22	18.6%
Resiliency Scales for Children and Adolescents (RSCA)	X	X	X	X	✓	✓	X	2	16	13.6%
Resilience Scale for Adolescents (READ)	X	✓	X	✓	X	✓	✓	4	10	8.5%
Brief Resilience Scale (BRS)	X	✓	✓	X	X	X	✓	3	4	3.4%

Figure 1
Flow Diagram of Scoping Review



Note. Adapted from Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) diagram in Figure 1 (Moher et al., 2009).

1.3.1 Analysis of Psychometric Evidence

Scale strengths and weaknesses based on the three point scoring system are presented in Table 3. Each of the nine criteria has been given equal weight in the summation score (Table 4): a maximum of four points was possible for the theory formulation stage; six points for the reliability evidence stage; four points for the validity evidence stage; and four points for the application stage.

1.3.2 Theory Formulation (maximum of four points)

Measures awarded four points. CYRM and READ achieved the maximum score for both inclusion of adolescents in the development of items, and in the dimensionality (constructs and levels) in the scales. This is not surprising given the theoretical shift in developmental and social-ecological approaches to adolescent resilience in the literature (Masten et al., 2021).

Measures awarded two points. All the other scales were awarded one point for each of the criteria in theory formulation with a sum of two points.

Measures awarded one point. BRS, given it is the only reported uni-dimensional scale, received only one point across the two criteria.

Table 2
Summary Information of Resilience Scales

Measure, Author(s)	Scale's purpose	Developmental sample (s)	Internal Constructs	External Constructs
Connor-Davidson Resilience Scale (CD-RISC; Connor & Davidson, 2003)	A well-validated, fast and easy to administer psychometric measures of successful stress-coping ability. The scale is reported to demonstrate that resilience is modifyable and positively associated with treatment of psychopathology and global improvement. Additionally, the authors propose resilience can be measured with the scale to screen for individuals who may be more adaptable in the face of	General population (n = 577); Clinical samples including; Primary care outpatients (n = 139); Psychiatric outpatients (n = 43), PTSD (n = 44); Anxiety Disorders (n = 25) N = 806, mean age 43.8 (15.3) years	Personal competence, high standards, and tenacity Trust in one's instincts, tolerance of negative affect, and strengthening effects of stress Positive acceptance of change and secure relationships Control	None
Child and Youth Resilience Measure (CYRM; Unger & Liebenberg, 2011)	A culturally sensitive measure of youth resilience. Based on a socially ecological interpretation of resilience, the scale measures a child or adolescent's capacity to navigate to both internal and external resources, as well as their capacity to negotiate access to the available resources.	1,451 youth mean aged 16.85 years, (694 boys = 47.9%, 757 girls = 52.1%) from 11 different countries grouped into self-identified visible minority (44.3%) and the remaining categorised as visible majority (55.3%) (Ungar & Liebenberg, 2011).	Individual	Relational Community Contextual
Resiliency Scales for Children and Adolescents (RSCA; Prince-Embury, 2008)	Includes three scales, each administered in five minutes, that assess the relative strength of three aspects of personal resiliency. The scale also offers two indexes (Vulnerability and Resource).	An initial adolescent community standardisation sample (n = 200). In addition, a separate adolescent clinical sample that consisted of 144 adolescents with depression (n = 45), anxiety (n = 26), conduct disorder (n = 38), bipolar (n = 8), and unspecified disorders (n = 27) were included in a separate standardization sample.	Sense of Mastery (MAS) Sense of Relatedness (REL) Emotional Reactivity (REA) and Vulnerability (VI) and Resource Index (RES)	None

Note. ICC = intraclass correlation coefficient; EFA = exploratory factor analysis; CFA = confirmatory factor analysis; RMSEA = root-mean-square error of approximation; SRMS = standardized root-mean-square residual; CFI - comparative fit index;

TLI = Tucker-Lewis index.

MAS = Sense of Mastery Scale, REL = Sense of Relatedness Scale, REA = Emotional Reactivity Scale, VI = Vulnerability Index, RES = Resource Index.

Table 2 (cont.)
Summary Information of Resilience Scales

Measure, Author(s)	Scale's purpose	Developmental sample (s)	Internal Constructs	External Constructs
Resilience Scale for Adolescents (READ; Hjemdal et al., 2006)	Measures resilience in adolescents that includes characteristics representing all three higher order categories of resilience (individual disposition attitudes, family support and cohesion and external support systems), that are thought to modify the effects of adverse situations and negative life events.	421 Norwegian Adolescents aged 13-15 years	Personal competence Social competence Structured style	Family cohesion Social resources
Resilience Scale (RS-25; Wagnild & Young, 1993)	Identify individuals who are or have the capacity to be resilient, and to provide empirical support for the relationship between resilience and psychosocial adaptation.	Scale developed on sample of 24 Caucasian women mean age = 78.1 years, and then applied to 6 study populations 3 100% female, mean ages 31.8, 33.4 and 30.7 (years), and 3 elderly populations mean ages 70.5, 73.4 and 71.1 (years), majority female. 5 studies presented in the validation study as prior evidence of validity, where unpublished masters thesis papers. All populations were described as largely healthy happy samples.	Personal competence Acceptance of self and life	None
Brief Resilience Scale (BRS; Smith et al., 2008)	The BRS was developed to provide a useful summary score of the characteristics that may increase the likelihood of resilience, the ability to bounce back from adverse events.	354 individuals from one US community across 4 samples (2 undergraduate student samples and 2 clinician and non-clinical samples) ranging in age 19 - 64 years	Resilience	None

Note. ICC = intraclass correlation coefficient; EFA = exploratory factor analysis; CFA = confirmatory factor analysis; RMSEA = root-mean-square error of approximation; SRMS = standardized root-mean-square residual; CFI - comparative fit index;
 TLI = Tucker-Lewis index.
 MAS = Sense of Mastery Scale, REL = Sense of Relatedness Scale, REA = Emotional Reactivity Scale, VI = Vulnerability Index, RES = Resource Index.

Table 2 (cont.)
Summary Information of Resilience Scales

Measure, Author(s)	Reliability of Test Scores (All Cronbach's α)	Evidence of Validity	Later Versions in Literature (beyond the scope of this review)
Connor-Davidson Resilience Scale (CD-RISC; Connor & Davidson, 2003)	EFA supported 5 factors with internal consistency for full scale $\alpha = 0.89$ $n = 577$, ICC .87, $n = 24$ & 22. (Connor & Davidson, 2003). In an adolescent population ($n = 199$) internal consistency for full scale $\alpha = .89$; Correlations with CD-RISC 22-item version .98, and 10-item version .89, CFA did not support 5-factor model, however best fit was for the unidimensional 10-item model (Campbell-Sills & Stein, 2007), RMSEA = .062, CFI = .948, TLI = .934 (Gucciardi et al., 2011)	Evidence based on test content: literature review Validity argument: positively correlated to hardiness $r = .83$ $n = 30$, social support $r = .36$ $n = 589$, and negatively correlated to perceived stress $r = -.76$ $n = 24$, disability $r = -.62$ $n = 40$, stress vulnerability $r = -.32$ $n = 591$; and divergent; not correlating to sexual dysfunction $n = 19$ (Connor, Davidson, 2003).	CD-RISC-10 (Campbell-Sills et al., 2009; Tomy & Weinberg, 2018) CD-RISC-2 (Vaishnavi et al., 2007)
Child and Youth Resilience Measure (CYRM; Unger & Liebenberg, 2011)	The original 58-item version subsets of the CYRM suggested reliability in two Canadian samples; individual ($\alpha = .803$), relational ($\alpha = .833$) and contextual ($\alpha = .794$). ICC α ranged from .583 to .773 $n = 410$ with test intervals across 12 months. EFA supported 3-factor model with 10 cross-loadings which were theoretically appropriate to be retained. CFA supported the 3-factor model RMSEA = .046, CFI = .959, TLI = .957 (Liebenberg et al., 2012). Further reliability evidence was reported in an at-risk New Zealand sample $N = 593$; 4-factor model supported by differentiating in this New Zealand population between Context: Social/Cultural, family, individual, and Contextual: Spiritual/Community Internal consistency reported as Individual ($\alpha = 0.662$), Family ($\alpha = 0.805$), contextual: social/cultural ($\alpha = 0.772$), and contextual: spiritual/community ($\alpha = 0.746$), test-retest evidenced with paired-sample t test finding no significant difference between test taken $n = 38$, one month apart. EFA on half the sample ($n = 296$) was followed by CFA on the other half ($n = 297$) which supported 4-factor model RMSEA = .021, CFI .982, TLI = .977 (Sanders et al., 2017).	Evidence based on test content: theory and adolescent consultation in 9 countries (Ungar & Liebenberg, 2011) Validity argument: prosociality $r = .411$, life satisfaction $r = .401$, caregiver closeness $r = .346$, caregiver affection $r = .321$, $n = 593$; (Sanders et al., 2015).	CYRM-12 (Liebenberg et al., 2013) CYRM - 24 (Govender et al., 2017) CYRM-28 (Sanders et al., 2017)
Resiliency Scales for Children and Adolescents (RSCA; Prince-Embury, 2008)	In adolescent sample; Internal consistency subscales and indexes ranged between $\alpha = 0.94$ and 0.97; Test-retest ($n = 65$, mean test interval 8 days) subscales and indexes ranged between $\alpha = .74$ to .88 (Prince-Embury & Courville, 2008) CFA 3-factor model RMSEA = .052, CFI = .976 (Prince-Embury, & Courville, 2008). A 3-factor 59-item model was best fit RMSEA = .052, CFI = .976 (Sætren et al., 2019).	Evidence based on test content: literature review Validity argument: Correlations as expected between scales included; MAS with self-efficacy $r = .691$, reappraisal $r = .425$, prosociality $r = .344$, emotional problems $r = -.433$, conduct problems $r = .442$ and mood difficulties $r = -.442$; REL and self-efficacy $r = .382$, reappraisal $r = .264$, emotional problems $r = -.415$, conduct problems $r = -.462$, peer problems $r = -.306$ and mood difficulties $r = -.56$; REA with suppressions $r = -.346$, conduct problems $r = .414$, hyperactivity $r = .423$ and mood difficulties $r = .403$; $n = 41$) (Sætren et al., 2019) Concurrent validity (predictive) in a sample of $N = 200$ was reported for VI which positively correlated with Anxiety $r = .65$, Disruptive Behaviour $r = .66$, Depression $r = .75$ and Anger $r = .77$; and for REA which positively correlated with Anxiety $r = .65$, Disruptive Behaviour $r = .67$, Depression $r = .74$ and Anger $r = .76$ (Prince-Embury, 2008).	RSCA - 59 (Sætren et al., 2019)

Note. ICC = intraclass correlation coefficient; EFA = exploratory factor analysis; CFA = confirmatory factor analysis; RMSEA = root-mean-square error of approximation; SRMS = standardized root-mean-square residual; CFI = comparative fit index; TLI = Tucker-Lewis index.

MAS = Sense of Mastery Scale, REL = Sense of Relatedness Scale, REA = Emotional Reactivity Scale, VI = Vulnerability Index, RES = Resource Index.

Table 2 (cont.)
Summary Information of Resilience Scales

Measure, Author(s)	Reliability of Test Scores (All Cronbach's α)	Evidence of Validity	Later Versions in Literature (beyond the scope of this review)
Resilience Scale for Adolescents (READ; Hjemdal et al., 2006)	Total score α .94; factors ranged α .69 and α .85 (Hjemdal et al., 2006) Total scores for 2 samples α = .90 & .89; factors ranged α = .57 to .85, and α .60 to .81 (lowest in both samples was Structured Style) (Janousch et al., 2020). CFA 5-factor model in Norwegian population: RMSEA = .034, CFI = .927, SRMR = .073 (sig. chi-sq) (Hjemdal et al. 2006) CFA 5-factor model with omission of item 4, 27-items: RMSEA = .039, SRMS = .053, CFI = .918, TLI = .907 in German sample, and RMSEA = .041, SRMS = .057, CFI = .912, TLI = .90 in Swiss population.	Evidence based on test content: items drawn from Resilience Scale for Adults /literature review (Friborg et al., 2003), then feedback from adolescents to refine the wording of some items (Hjemdal et al., 2006; von Soest et al., 2010) Validity argument: Negative correlation with depression r = .60, factors correlated with same ranging from -.65 to -.35 (Hjemdal et al., 2006). Positive correlations between total and subscales with self-esteem ranging from r = .2 to .51, self-efficacy ranging from r = .29 to .54, life satisfaction ranging from r = .2 to .5. Negative correlations with depression ranging r = -.18 to -.49, and anxiety ranging -.14 to -.37 (Janousch et al., 2020).	READ 23 (von Soest et al., 2010)
Resilience Scale (RS-25; Wagnild & Young, 1993)	Internal consistency over six studies ranged from α = .76 to .91; Test-retest perinatal participants .67 to .84 over 18 month period A 2-factor model was evidenced by PCA to support construct validity (Wagnild & Young, 1993), however was not followed up in the literature by CFA.	Evidence based on test content: qualitative study of 24 mature women and a literature review. Validity argument: Positively correlated with depression r = -.37, morale r = .28, life satisfaction r = .30 in n = 810 (Wagnild & Young, 1993). In an adolescent sample of youth experiencing homelessness n = 59, resilience was negatively correlated as expected with loneliness r = -.50, hopelessness r = -.47, life-threatening behaviours r = -.52 and unexpectedly negatively correlated with social connectedness r = -.41 (Rew et al., 2001).	RS-14 (Wagnild, 2009; Zelviene et al., 2021)
Brief Resilience Scale (BRS; Smith et al., 2008)	Internal consistency across 4 samples ranged from α = .80 to α = .91; Test-retest in two samples with intervals of 1 months and 3 months respectively ICC of .69 (n = 48) and .62 (n = 61), PFA reported single factor model (Smith et al., 2008) CFA single factor model (with adjusted negative item response bias) RMSEA = .033, SRMS = .013, CFI = .997 (McKay, et al., 2021).	Evidence based on test content: consultation with research team and piloting with undergraduate students to find fewest items possible to capture global resilience. Validity argument: Expected negative correlations with perceived stress r = -.60, Anxiety r = -.46, Depression r = -.41, Negative affect r = -.34, Physical symptoms r = -.39, and expected positive correlation with Positive affect r = .46 (Smith et al., 2008). Expected correlations between BRS and life satisfaction (r = .42), positive affect (r = .48), extraversion (r = .31), agreeableness (r = .23), openness (r = .15) and conscientiousness (r = .34), and negatively associated with negative affect (r = -.50), perceived stress (r = -.64) and neuroticism (r = -.66) N = 288 (McKay et al., 2019).	

Note. ICC = intraclass correlation coefficient; EFA = exploratory factor analysis; CFA = confirmatory factor analysis; RMSEA = root-mean-square error of approximation; SRMS = standardized root-mean-square residual; CFI = comparative fit index; TLI = Tucker-Lewis index.
 MAS = Sense of Mastery Scale, REL = Sense of Relatedness Scale, REA = Emotional Reactivity Scale, VI = Vulnerability Index, RES = Resource Index.

Table 3

Criterion Measure	Definition	Score	Scoring Criteria
1 Theory Formulation			
1.1 Evidence based on test content	The extent to which the construct is comprehensively sampled by scale items.	2	Clear description of item selection AND involvement of target (adolescent) population AND subject matter experts in item selection/development
		1	Either target population OR subject matter experts NOT involved in item development/selection
		0	Incomplete description of item development/selection
1.2 Dimensionality	The extent to which the scale is multi-dimensions (domains and levels)	2	Multi-dimensional AND Multi-level (individual, family, community)
		1	Multi-dimensional at individual level only
		0	Uni-dimensional
2 Reliability Evidence			
2.1 Internal Consistency	Extent to which (sub) scale items correlate to determine whether items are meaning the same construct.	2	Cronbach's alpha > .70 for total scale and/or subscales
		1	Cronbach's alpha values of < .70 for total scale and/or subscales
		0	Insufficient information
2.1 Stability	Scores on repeated administrations of same test highly correlated OR scores on similar version of the same test highly correlated.	2	Values of > .70 for test re-test or parallel forms (> .75 if ICC reported)
		1	Test-retest or parallel forms < .70
		0	Insufficient information
2.3 Replicability	EFA followed by CFA to empirically support hypothesised factor structure.	2	CFA criteria for good model fit (TLI/CFI > .95, SRMR > .08, RMSEA < .08); OR EFA primary factor loading > .60, absence of salient cross loading with $n > 100$ AND > 3 items per factor
		1	EFA with $n < 100$ AND < 30-items per factor with loadings > .60 AND/OR cross loadings > .32; OR CFA does not meet good model fit and is NOT performed using separate sample from EFA
		0	Insufficient information
3 Validity Evidence *			
3.1 Discriminant Validity	Test scores showed negative correlations in theoretically expected directions with related measures.	2	Correlation of test scores > -.30 or more with theoretically distinct measure
		1	Test score correlations with theoretically distinct measure < -.30; OR correlation with theoretically ambiguous measure
		0	Insufficient information
3.2 Convergent Validity	Positive correlations of test scores in theoretically expected directions with related measures.	2	Correlation of test scores at > .30 with conceptually similar measure
		1	Correlation of test scores at < .30 with conceptually similar measure OR correlation with theoretically ambiguous measure
		0	Insufficient information
4 Application			
4.1 Frequency in Salient Reviews	Refers to the number of separate salient (see literature review) resilience scale reviews.	2	Included in 5 - 7 of the 7 salient reviews listed in literature review.
		1	Included in 3 - 4 of the 7 salient reviews listed in literature review.
		0	Included in > 3 of the 7 salient reviews listed in literature review.
4.2 Frequency in Empirical Studies of Adolescent Resilience	Refers to the number of separate empirical studies of adolescent resilience since 2020.	2	Many: > 12 published studies on adolescent resilience identified in the current scoping review.
		1	Several: 5 - 12 published studies on adolescent resilience identified in the current scoping review.
		0	Few: < 5 published studies on adolescent resilience identified in the current scoping review.

Note. ICC = intraclass correlation coefficient; EFA = exploratory factor analysis; CFA = confirmatory factor analysis; RMSEA = root-mean-square error of approximation; SRMS = standardized root-mean-square residual; CFI - comparative fit index; TLI = Tucker-Lewis index.

* Validity can also be evidence of criterion related evidence in absence of criterion measure (Cronbach & Meehl, 1955).

1.3.3 Reliability Evidence (maximum of six points)

Measures awarded six points. Only one scale was awarded full points for each of the three criteria in this stage, RSCA, largely achieved by recent validation studies that have addressed earlier reliability concerns for the scale.

Measures awarded five points. Of the three scales that were awarded five points, CD-RISC lost one point for not adequately supporting replicability (goodness-of-fit), CYRM and BRS both lost one point for not reaching required threshold for internal consistency $\alpha > .70$.

Measures awarded three points. READ lost a point for internal consistency as not all reached $\alpha > .70$ and scored a zero on stability by not reporting in either cited study test-retest or parallel forms. RS lost 1 point as not all were $> .70$ on test-retest scores. Additionally, RS was awarded a zero as PCA is not an appropriate test of construct validity (Gruijters, 2020) and no further confirmation of the factor model could be found in the literature.

1.3.4 Validity Evidence (maximum of four points)

Measures awarded four points. CD-RISC, RSCA and BRS all were awarded full points for providing adequate construct validity.

Measures awarded two points. Neither CYRM or RS provided adequate information on divergent validity and were thus awarded zero points. Both scales were awarded full points for convergent validity. The READ was awarded one point for both construct validity criteria, losing one point as not more than 75% of validity arguments were supported (Terwee et al., 2007) by coefficients above the threshold of .30.

1.3.5 Application (maximum of four points)

Measures awarded four points. The more applied scales were also the more reviewed, hence full scores for CD-RISC, RS, CYRM.

Measures awarded two points. The RSCA was more frequently used than the READ exceeding the threshold to be awarded two points, however, was reviewed fewer times than the READ.

Measures awarded zero points. The BRS was infrequently reviewed or applied to studies of adolescent resilience, falling below the frequency cut off scores to be awarded points.

1.3.6 Summary of results of psychometric evaluation

The maximum points available was 18 points, with three scales reaching the “adequate” score standard of 78% (CD-RISC, CYRM, RSCA) and the remaining scales attaining between 56% and 61%. At the theory formulation stage, the scales with a developmental and social-ecology foundation scored the highest (CYRM, READ). Scales for general use across the lifespan, or which have been adjusted for adolescence based on theory, rather than a consultation with adolescents, scored better than the only reported uni-dimensional score of global resilience. At the reliability evidence stage, scales generally lost points for Cronbach’s alpha not consistently reaching .70 across total and subscale scores, or for limitations in confirmatory factor analysis. Similarly, in the validity evidence stage, lower than ideal correlation coefficients on at least 75% of the validation hypothesis scores were the weak point for an otherwise well performing READ. No divergent validity evidence was evident across some scales (CYRM, RS and BRS). Finally in the application and final stage, the longevity of scales was an advantage.

Table 4

Scale Name, Items (domains)	CD-RISC - 25 (5)	CYRM - 28 (4)	RSCA - 64 (3)	READ - 28 (5)	RS-25 (2)	BRS - 6 (1)	
Strongest Evidence Scored in Validation Studies Cited	Connor & Davidson, 2003 Gucciardi et al., 2011	Liebenberg et al., 2012 Sanders et al., 2015	Prince-Embury & Courville, 2008 Sætren et al., 2019	Hjemdal et al., 2006 Janousch et al., 2020	Wagnild & Young 1993	Smith et al., 2008 McKay et al., 2021	
Criterion							
1	Theory Formulation						
	1.1 Evidence based on test content	1	2	1	2	1	1
	1.2 Dimensionality	1	2	1	2	1	0
2	Reliability Evidence						
	2.1 Internal Consistency	2	2	2	1	2	2
	2.1 Stability	2	1	2	0	1	1
	2.3 Replicability	1	2	2	2	0	2
3	Validity Evidence						
	3.1 Discriminant Validity	2	0	2	1	0	2
	3.2 Convergent Validity	2	2	2	1	2	2
4	Application						
	4.1 Frequency in Salient Reviews	2	2	0	1	2	0
	4.2 Frequency in Empirical Studies of Adolescent Resilience	2	2	2	1	2	0
	Total Score out of possible 18	15	15	14	11	11	10
	%	83%	83%	78%	61%	61%	56%

Note. CD-RISC - 25 (5) = 5-factor, 25-item version of Connor-Davidson Resilience Scale; CYRM - 28 (4) = 4-factor, 28-item version of Child and Youth Resilience Measure; RSCA-64 (3) = 3-factor, 64-item version of Resiliency Scales for children and Adolescents relating to Adolescent subsample; READ-28 (5) = 5-factor, 28-item version of Resilience Scale for Adolescents; RS-25 (2) = 2-factor, 25-item version of Resilience Scale; BRS (1) = 1-factor, 6-item version of Brief Resilience Scale.

1.4 Discussion

This study presents the findings of a systematic scoping review of adolescent resilience scales used in research published in the past two decades. The aim was to contribute to the literature by providing a critical and systematic assessment of the theoretical formulation, psychometric characteristics, and applicability of the most used self-report resilience scales used in this area of research.

The systematic scoping review of the literature found that the most common applied scales were the original versions of the CD-RISC (all seven reviews and approximately 30% of the papers, all published between 2010 and 2021), and RS (six of seven reviews and approximately 30% of the papers, all published between 2005 and 2021). These scale's inclusion in most systematic reviews of resilience measures is not particularly surprising, given that of the six scales, these two have the earliest published dates (2003, 1993 respectively), and have been designed and applied to adult resilience research. The next three most selected scales, CYRM (five of seven reviews and 18.6% of the papers, all published between 2013 and 2021), RSCA (two of seven reviews and 13.6% of the papers, all published between 2009 and 2018), and the READ (four of seven reviews and 8.5% of the papers, all published between 2015 and 2020) were all developed specifically for children or adolescents. The least selected scale was the BRS (three of seven reviews and 3.4% of the papers, all published between 2014 and 2019).

The scales with a developmental and social-ecology foundation (CYRM, READ), scored the highest in theoretical formulations for the population of interest (adolescents). The development phase of these two scales included consultation with experts (on developmental and social-ecological resilience theories), and with adolescents. Terwee et al., (2007) posit that item selection and wording ideally should reflect areas of importance to the target population. More recent scales that were more closely aligned with developmental and systems approaches to research and interventions (CYRM and READ) may feature more prominently in future

reviews, potentially bolstering their frequencies in the literature in the future. Scales for general use across the lifespan (CD-RISC, RS), or those that have been adjusted for adolescents based on theory (RSCA), rather than consultation with adolescents, scored better than the only reported uni-dimensional score of global resilience (BRS).

Studies often do not adequately report on the psychometric properties of selected scales (Slaney et al., 2009), and the choice of resilience scales can result in questionable findings (Eiser & Morse, 2001; Windle et al., 2011). Systematic reviews of resilience scales have lacked a unified critical and systematic framework for assessing the psychometric adequacy of scales (Pangallo et al., 2015; Windle et al., 2011). The current study, adapting a construct validity approach (Skinner, 1981), provided one such framework, following Pangallo et al., (2015) arbitrary cut off for “acceptable”, with 78% of the nine criteria being fully met, set as the cut off for “adequacy”. Three scales met or exceeded the 78% threshold for “adequacy”. Both the CD-RISC and CYRM reached 83% and the RSCA was also found adequate at 78%. The difference in strength of internal and validity evidence between the RSCA and the READ was the lack of test-retest or ICC data (Terwee et al., 2007), or less than 75% of convergent/divergent correlation coefficients exceeded .70 which is considered by Terwee et al., (2007) necessary to sufficiently confirm the validity hypotheses a priori. Terwee et al., (2007) state that this is an important marker of rigorous validity testing, often overlooked by peer reviewers and authors of systematic reviews. Given consideration of the complexity of adolescent resilience, and the necessity for a dynamic multi system developmental approach to researching adolescent resilience (Ungar, 2006; Ungar & Theron, 2020), and that CYRM scored higher than CD-RISC, theoretical foundations may be an important differentiation between the two scales that scored as most adequate for the adolescent population.

1.4.1 Strengths and Limitations

Strengths of the current scoping review include the use of more robust analysis than earlier reviews of adolescent resilience scales. Taking into consideration the certain incompleteness of any search of the literature, the omission of prioritising one psychometric characteristic over another, and bearing in mind that a lower score is not necessarily indicative of a poor-quality scale, but of insufficient data, the use of quantitative comparisons is informative but not definitive. A possible limitation of the review is the frequency criteria for inclusion in prior reviews, and the number of peer reviewed research studies used to select each scale. These criteria undoubtedly resulted in the exclusion of popular brief versions of the included scales that were outside the scope of this study, such as the CYRM-12 (Liebenberg et al., 2013) which reports improved goodness-of-fit and strengthened validity, two stages of evidence criterion that fell short for the CYRM in the current review. Another limitation is the exclusion of grey literature, which would have most likely increased the visibility of psychometric scales used in school and organisation-based interventions for adolescents, providing more information about the extent that research-based scales are used in screening and in the evaluation of interventions.

1.4.2 Conclusion

The scoping review provides an overview of the relative strengths and weaknesses of the frequently selected scales for measuring adolescent resilience, which can then inform the future selection of measures. Established scales developed for adult populations are commonly used, however the growing attention being given to psychometric credibility favours scales developed specifically for adolescents. No scale was awarded full sum of points, consistent with the finding that no gold standard resilience scale exists. When selecting a resilience scale, and a thorough assessment of the adequacy of reported psychometric and supporting evidence is considered, more than passing attention needs to be given to psychometric credibility. If priority is given to the theoretical foundation of scales, then the CYRM is the most adequate for measuring resilience in adolescent populations. This review has highlighted the importance of a transparent and

thorough reporting of all validity hypotheses and testing, which contribute to the selected scale's psychometric credibility. Additionally, the review highlights the importance of undertaking a critical appraisal of the validity evidence reported for scales, and the usefulness of examining validation studies and empirical studies with similar populations, to establish the strength of validity arguments offered by the developers of a scale.

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1.6 Appendices

Appendix A

PsycINFO Full Search Terms

MM “Resilience (Psychological)” OR resilien* AND MM “Stress and Coping Measures” OR questionnaire* OR scale OR instrument OR survey OR MM “Psychometrics” OR MM “ Classical Test Theory” OR MM “consistency (Measurement)” OR MM “ Error of Measurement” OR MM “External Validity” OR MM “Factor Analysis” OR MM “Internal Validity” OR MM “Item Analysis (Test)” OR MM “Item Response Theory” OR MM “Measurement Invariance” OR MM “Measurement Models” OR MM “Multivariate Analysis” OR MM “Test Construction” OR MM “ Test Reliability” OR MM “Test Sensitivity” OR MM “Test Specificity” OR MM “Test Validity” OR MM “Variability Measurement” AND adolescen* OR Youth OR teen* OR “young people” OR “young person”. Limiters included - Linked Full Text, Expanders included – Apply equivalent subjects; Narrowed by Subject Age – adolescence (13 – 17 years); Search modes = Find all my search terms

Appendix B

Excluded Scales

1. Academic Risk and Resilience Scale (Martin, 2013)
2. Acculturation and Resilience Scale for Adolescents (AARS-A; Khawaja, & Carr, 2020)
3. Adolescent Resilience Attitudes Scale (ARAS; Biscoe & Harris, 1994)
4. Adolescent Resilience Questionnaire (ARQ Gartland et al., 2011)
5. Adolescent Resilience Scale (ARS; Oshio et al., 2003)
6. Bereavement Risk and Resilience Index (BRRI; Layne & Kaplow, 2012)
7. California Healthy Kids Survey; Resilience Youth Development Module (RYDM; Hanson & Kim, 2007)
8. Chinese Resilience Scale (Yuegin & Yiqun, 2008)
9. Comprehensive Resilience Scale (CRS; Ohara et al., 2020)
10. Diabetes Strengths and Resilience measure for adolescents (DSTAR-Teen; Ohara et al., 2020)
11. Ego Resiliency Scale (ER89; Block & Kremen, 1996)
12. Gender Minority Stress and Resilience Measure (Testa et al., 2015)
13. Jamaican Youth Risk and Resiliency Behaviour Survey (JYRRBS; Wilks et al., 2006)
14. Polk Resilience Patterns Scale (PRPS; Polk, 2000)
15. Resilience Factors Scale (STOP-SReFS; Rodríguez-Quiroga et al., 2020)
16. Resilience Scale for School-Aged Children (SV-RES; Saavedra, & Villalta, 2008)
17. Resilience Scale of the Behavioral Assessment for Children of African Heritage (subscale of BACAH forms; Lambert et al., 2005)
18. Risk and Resiliency Checkup (RRC; Lee, 2013)
19. RSCA (Resilience Scale for Chinese Adolescents Hu, & Gan, 2008.)
20. San Diego Risk and Resiliency Checkup (Liddle, n.d)
21. School Resilience Scale (SRS; Caleon & King, 2020)
22. Suicide Resilience Inventory-25 (SRI-25; Gutierrez et al., 2010)

Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	i
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	i
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	5
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	5
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	No registered protocol
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	6
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	6 - the search was conducted on 20 July 2021
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	32
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	6
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	7
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	7
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	7 and 8

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	7 and 8
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	8 & 9
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	12 to 15
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	19
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	19
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	10 to 18
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	18
Limitations	20	Discuss the limitations of the scoping review process.	22
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	22 and 23
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	No funding

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

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