

A scoping review and evaluation of instruments used to measure resilience among post-secondary students

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ABSTRACT

As mental health problems continue to increase among post-secondary populations, the need to develop effective initiatives designed to bolster students' resilience has increasingly been identified as a priority. Therefore, access to valid tools with which to measure the efficacy of these interventions is imperative. To date, a comprehensive assessment of existing instruments used to evaluate the construct of resilience among post-secondary student populations has not been conducted. The purpose of this study was to fill this gap by conducting a scoping review of literature detailing the use of resilience instruments and evaluating their quality based on suitability for use in the post-secondary setting and associated psychometric evidence. We identified a total of 78 records published between 2010 and 2022, extracting a total of 12 instruments. Using detailed criteria frameworks, each instrument was assessed in terms of suitability and quality of associated psychometric evidence for validity and reliability. The results of our study suggest that many of the instruments currently being used to assess resilience among post-secondary students may not be appropriate. The majority of the instruments included in our review were developed for use among general adult populations and not specifically designed for use in the post-secondary setting. Most instruments did not assess resilience in a comprehensive, holistic manner that addressed the ability to bounce back from adversity by drawing upon psychological, social, cultural, and environmental resources, as defined by recent research. Further, no instruments included in our review had published evidence in support of a complete psychometric analysis. The results of our evaluation suggest that the Connor-Davidson Resilience Scale (CD-RISC) is the most suitable instrument for measuring resilience among post-secondary populations due to its suitability, comprehensive assessment of the construct of resilience, and demonstrably strong psychometric properties for both the 25- and 10-item versions of the tool.

1. Introduction

Major life transitions, including the shift from high school to post-secondary education, can present both difficulties and opportunities for growth. The majority of post-secondary students fall within the age bracket of emerging adulthood (ages 18–25 years), a period of significant identity formation and transition (Arnett, 2000; Patel et al., 2007). As a result, many emerging adults have not yet developed a strong set of healthy coping skills, creating a susceptibility to mental health deterioration and the development of mental illnesses (Duffy et al., 2020).

Post-secondary students are faced with a variety of academic, financial, personal, and social stressors, placing them at increased risk for mental health problems in the absence of effective stress management (Gollust et al., 2008; Linden and Stuart, 2020). Data collected from

Canadian post-secondary institutions in 2019 through the National College Health Assessment (NCHA II) survey ($n = 55\,284$) revealed that large proportions of students reported feeling hopeless (63.6%), overwhelmed (88.2%), and anxious (68.9%) within the past 12 months. Many students also self-reported having received a diagnosis of anxiety (24%), depression (20%) or a dual diagnosis of both (16%) within the past year (American College Health Association, 2019). The Post-Secondary Student Stressors Index (PSSI), a tool designed to evaluate the sources of student stress, demonstrated a negative correlation with resilience, suggesting that as the number of stressors experienced by students increased, students' level of resilience decreased (Linden & Stuart, 2019). The COVID-19 pandemic further introduced novel stressors in addition to exacerbating those already experienced by students, including a mandatory transition to online learning, isolation and

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loneliness resulting from campus closures, anxiety about meeting educational milestones and securing employment following graduation, and financial strain (Sahu, 2020; Lee 2020). Indeed, population-based data collected by Mental Health Research Canada has demonstrated that post-secondary aged Canadians were the group most likely to report increased symptoms of anxiety and depression over the course of the pandemic. The survey found that 19% of Canadians aged 18–34 were diagnosed with depression, and 21% with anxiety (Mental Health Research Canada, 2020).

The concept of *resilience*, or the ability to bounce back from adversity, has increasingly been identified as an important factor in students' ability to effectively cope with daily stressors faced within the post-secondary setting (Eisenberg et al., 2007). Though resilience has been identified in several studies as an essential component to managing stress and maintaining positive mental health (Gao et al., 2017; Gheshlagh et al., 2017), these complex concepts remain understudied among diverse groups of post-secondary students. At its most basic level, resilience refers to the ability to cope with adverse events. Existing research suggests that three major factors contribute to resilience: psychological/dispositional attributes (i.e., self-esteem, optimism, emotional regulation), family support and cohesion, and external support systems (i.e., family/friend support, community relationships) (Garmezy, 1993; Rutter, 1990; Werner, 1989, 1993). Rutter (2006) defined resilience as a reduced vulnerability to environmental risks (i.e., stressors), the overcoming of stress or adversity, or a good mental health outcome despite being faced with a stressor.

The related concepts of hardiness, grit, tenacity, and coping are often associated with resilience, however they are distinct constructs. *Hardiness* is defined as a personality trait that allows individuals to experience continued good health under stressful conditions, where hardy people are buffered against stress (Kobasa, 1979; Maddi & Kobasa, 1984). Hardiness can be found along the causal pathway to resilience during times of stress, as attributes related to hardiness (such as commitment and control) allow for thriving during stressful circumstances (Bonanno, 2004; Maddi, 2004, 2005). *Grit* is defined as perseverance and passion toward long-term goals and sustained commitment despite failure, setbacks, and adversity, while resilience refers to the ability to easily bounce back from adversity (Duckworth et al., 2007). Resilience is often considered an inherent attribute of grit (Stoffel and Cain, 2018). *Tenacity*, however, has been defined as “the combination of grit, resilience, self-control, psychological well-being and a growth mind-set, that provides students with the capacity to thrive at university” (Kannangara et al., 2020:6). Thus, tenacity is a larger construct made up of multiple components, including resilience. *Coping* refers to cognitive and behavioural strategies that help an individual to manage stressful events or negative psychological and physical outcomes (Folkman & Moskowitz, 2003). While regular employment of effective, adaptive coping mechanisms may lead an individual to experience a higher level of resilience, it is not a component of the construct of resilience itself (Chen, 2016).

Despite resilience having been highlighted in the academic literature in relation to mental health and wellbeing for some time, there is continued debate regarding the most appropriate definition of the construct. In 2019, Brewer and colleagues published a scoping review of the literature related to resilience in the context of higher education. Several key recommendations emerged from this review, including the need for a shared definition of resilience specific to the higher education context in order to inform the development of resilience-building interventions and guide future research. Brewer and colleagues found that resilience was viewed as a dynamic, contextual process focused on adaptation (to stress or change) which may be enhanced by interventions. The authors developed the following definition: “resilience is a dynamic process of positive adaptation in the face of adversity or challenge. [...] This process involves the capacity to negotiate for, and draw upon, psychological, social, cultural and environmental resources” (Brewer et al., 2019, p. 1114). This definition is more comprehensive

and holistic than those that came before it, while also including the foundational components of resilience as identified by earlier researchers. While it is easy to see where constructs such as hardiness, grit, tenacity, and coping may come into play, they are not contained within this comprehensive definition.

One concept reiterated throughout the resilience literature is an individual who is more resilient will be better equipped to manage stress. Therefore, the development of initiatives that aim to improve students' resilience is an important mental health promotion tool within the post-secondary setting. In fact, existing research has linked resilience to improved academic performance and the ability to respond to stress more effectively (Duffy et al., 2020; Gamble & Crouse, 2020). While efforts have indeed been made to develop initiatives to bolster students' resilience (e.g., resilience workshops, mindfulness exercises), researchers must have access to valid tools with which to measure student resilience in order to evaluate the efficacy of these interventions (Kunzler et al., 2020). Indeed, following their review, Brewer and colleagues (2019) identified a need for a comprehensive assessment of existing instruments used to evaluate the construct of resilience among post-secondary student populations. We are aware of two relevant reviews (Windle et al., 2011; Ahern et al., 2006), though both are outdated (conducted >10 years ago) and are non-specific to the post-secondary student population. Therefore, the purpose of this study was to fill this gap by conducting a scoping review of peer-reviewed research detailing the use of existing instruments to evaluate resilience among post-secondary students, and systematically evaluate their suitability for use among student populations and associated psychometric evidence, aligning with the definition of resilience created by Brewer and colleagues (2019).

2. Methods

We conducted a two-part study in order to evaluate the number and quality of existing instruments used to evaluate the concept of *resilience* among post-secondary students. First, we conducted a scoping review of peer-reviewed articles detailing the use of existing instruments to assess resilience among post-secondary students using Arksey & O'Malley's (2005) five-step methodological framework: 1) identification of the research question, 2) identification of relevant studies, 3) study selection, 4) data extraction, and 5) content analysis. We used this framework to operationalize the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, a more detailed description for which can be found elsewhere (Tricco et al., 2018). Secondly, we extracted the instruments identified in the articles included in the scoping review and completed an assessment of the quality of these instruments based on their *suitability* for use among student populations as well as their *psychometric properties*.

2.1. Scoping review of resilience literature

2.1.1. Identification of the research question

A broad research question with a clearly articulated target population, outcome of interest, and scope of inquiry was developed to ensure a comprehensive range of coverage: “Which instruments have been used to evaluate the concept of resilience in published studies conducted among samples of post-secondary students? Our secondary research question was “What is the quality of these existing instruments, as determined thorough an analysis of their validity, reliability, and appropriateness for the target population?”

2.1.2. Identification of relevant studies and selection

One member of the research team searched four large academic databases to obtain records: (1) Health and Psychosocial Instruments (HaPI), (2) Medical Literature Analysis and Retrieval System Online (Medline), (3) PsycINFO and (4) Cumulative Index of Nursing and Allied Health (CINAHL). Databases were searched using key word

combinations related to the following inclusion criteria: resilience (or resiliency), instrument or tool, and post-secondary. Reference mining was also completed for the articles included in our review. Searches were completed in June 2021 using key word and subject heading combinations, using truncations to capture variations where appropriate (Table 1). Records were restricted to peer reviewed journal articles published between August 2010 and August 2022 where resilience instruments were used among a sample of post-secondary students. This date range was selected to ensure studies were relevant to the experience of modern post-secondary students. Records were excluded if they were not available in English, were unpublished (e.g., grey literature), did not use an instrument intended to measure resilience, and/or the study population focused on a traumatic or critical life event. Inclusion and exclusion criteria were agreed upon by the research team prior to the search (Levac et al., 2010). Studies focusing on traumatic life events were excluded as we were interested in the evaluation of day-to-day resilience more generally, rather than in response to a traumatic event.

2.1.3. Data extraction and content analysis

Records were imported into Mendeley citation manager and screened for initial inclusion into the review by title. Records that met the inclusion criteria were exported into a tracking document where two reviewers completed an initial screening by title and abstract, with a third reviewer available to break ties. A full-text review was then completed to screen out any records that did not meet the inclusion and exclusion criteria, extracting the following information: 1) citation information [including author(s), title of article, journal, year of publication], 2) study population and research location, and 3) name of the resilience instrument described. This process-oriented method of data extraction is consistent with the approach recommended by Levac and colleagues (2010). Fig. 1 displays a flow diagram of the article selection and screening process. In total, 78 records and 12 instruments were included in the review.

2.2. Quality assessment of resilience instruments

A subsequent search was completed for information on the psychometric properties of the instruments identified through the scoping review. We adapted the psychometric evaluative criteria framework used by (Miles et al., 2018) to align with the *Standards for Educational and Psychological Testing* (“the Standards”) (American Psychological Association, National Council on Measurement in Education Joint Committee on Standards for Educational and Psychological Testing, 2014), and used this framework to systematically assess the *psychometric properties* of each instrument, ranking their evidence for validity and reliability as good, adequate, or inadequate based on the criteria laid out in Appendix A. We evaluated four types of evidence for validity: 1) content (the degree to which the items on an instrument represent the area of interest); 2) response processes (the extent to which participants’ responses to the items on an instrument align with the construct under study); 3) internal structure (the degree to which the relationships among items in the instrument are consistent with what is expected of the construct under study); and 4) relations to other variables (whether the scores from the instrument correlate significantly, and in the direction expected, with like and unlike constructs measured by existing, valid instruments). We also evaluated two types of reliability evidence: 1) internal consistency (the degree to which items in an instrument measure the same underlying construct of interest), and 2) test-retest

reliability (considers the temporal stability of an instrument, or the consistency of scores over time). To evaluate the *suitability* of the instruments for use within the post-secondary setting, we created a second evaluative criteria framework, assessing: 1) population, 2) scope, 3) applicability, and 4) accessibility as laid out in Appendix B.

3. Results

3.1. Summary of records included

A total of 12 instruments used to assess resilience among samples of post-secondary students were identified. Table 2 describes these instruments along with the studies that utilized them, including their year and country of publication, the study population and sample size used in analysis, and country of publication. The majority of records included were of quantitative nature, with few mixed methods and review studies, and no qualitative studies.

3.1.1. Connor-Davidson Resilience Scale (CD-RISC)

The CD-RISC is a self-report instrument originally created in 2003 (Connor & Davidson, 2003). Respondents are asked to rate each item on an adjectival scale from 0 (*not true at all*) to 4 (*true nearly all of the time*) based on their experiences in the past month. Ratings are summed for a composite score, which ranges from 0 to 100, where higher scores indicate greater resilience. The content of the scale was developed solely based on reference to existing literature focused on the construct of resilience. The original instrument was comprised of 25 items, with analyses among general population and patient samples providing evidence in support of the tool’s internal consistency and test-retest reliability, as well as validity, including internal structure evidence via exploratory and confirmatory factor analyses and strong relations to other variables. A 10-item version of the tool was then developed and validated in 2007 among a sample of undergraduate students (Campbell-Sills & Stein, 2007), with results providing strong evidence of internal consistency as well as construct validation, again evaluating internal structure by confirmatory and exploratory factor analyses and relations to other variables. Composite scores on the 10-item version range from 0 to 40.

The CD-RISC is intended to measure resilience, which the authors define generally as, “the ability to cope with adversity” (Connor & Davidson, 2003). The items included on the original, 25-item scale appear to align with Brewer and colleagues’ holistic definition of resilience, tapping psychological, social, and environmental factors, as well as cultural factors. Though shorter, the items retained for the 10-item version of the scale appear to similarly align with concepts outlined in Brewer and colleagues’ definition, however, items reflecting the ability to draw on cultural factors are absent. Ultimately, both versions of the tool are suitable for use among samples of post-secondary students, with the 25-item version being slightly more robust. Although the CD-RISC was not developed specifically for use among post-secondary students, it has been widely used among samples of students, youth, and young adults and has demonstrated strong psychometric properties among these populations as well as others (Davidson, 2018). In fact, based on the results of our review, the ten-item version of the CD-RISC appears to be the most widely used resilience tool among samples of students to date. In addition to demonstrating strong psychometric properties, the tool is also easily and freely accessible to all, and is widely available in several languages, with seventy-seven approved translations of the tool reported to date (Davidson, 2018). Our scoping review captured two instances of the French version of the CD-RISC used among a sample of post-secondary students. A recently published psychometric analysis determined it was a reliable tool to measure resilience in French-speaking populations (Guihard et al., 2018).

3.1.2. Resilience Scale 14 (RS14)

Created in 2009, the Resilience Scale-14 (RS14) is the brief version of

Table 1
Sample key word search strategy.

Key Words:	(‘resilience’ OR ‘resiliency’) AND (‘post-secondary’ OR ‘postsecondary’ OR ‘university’ OR ‘college’ OR ‘higher education’ OR ‘student’) AND (‘tool’ OR ‘instrument’ OR ‘scale’ OR ‘index’)
Limits:	(Date range = August 2010–August 2022) AND (language = English)

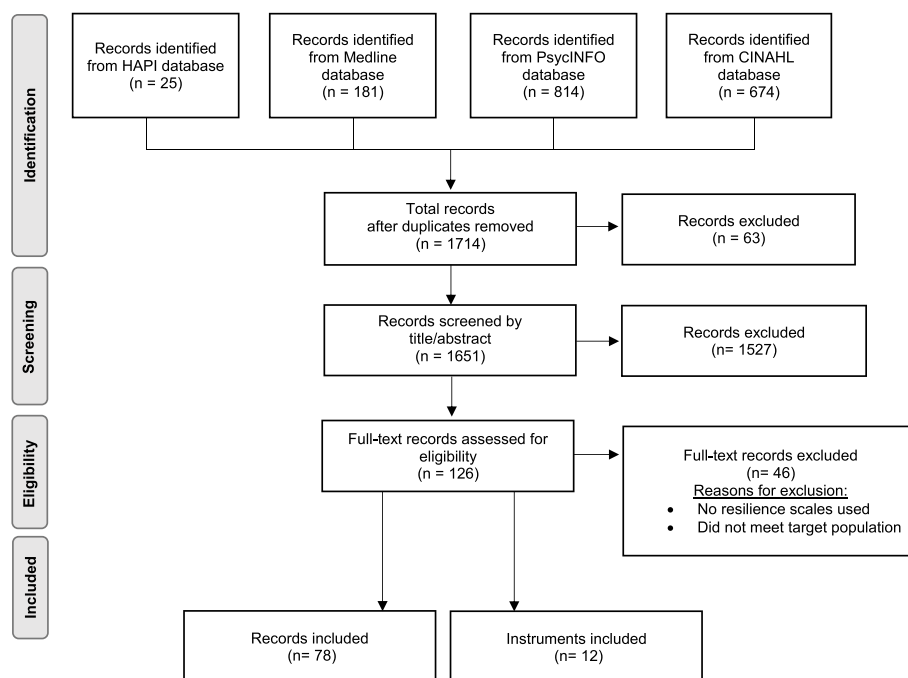


Fig. 1. PRISMA flow diagram for recording screening and selection.

the 25-item Resilience Scale (RS) (Wagnild & Young, 1993). Items are scored on a 7-point adjectival scale ranging from 1 (*disagree*) to 7 (*agree*). Ratings are summed for a composite score ranging from 14 to 98, where higher scores indicate greater resilience. Scoring guidelines are also provided by the authors, with cut points of very low resilience (14–56), low (57–64), moderate (74–81), moderately high (82–90), and high (91–98) (Wagnild, 2009). Content for the original scale was derived from qualitative responses from a small sample ($n = 24$) of older women who were asked to describe how they managed a self-identified loss. Five components of resilience were identified: equanimity, perseverance, self-reliance, meaningfulness, and existential aloneness (Wagnild & Young, 1993). The original RS was then reviewed by content experts, as well as compared to the literature for content validation.

The RS14 was created by retaining items from the RS that had the highest interitem correlations and that measured the five core components of resilience (Wagnild, 2009). Analyses among a sample of college students (Aiena et al., 2015) and Lithuanian adolescents (Zelviene et al., 2021). Provided evidence in support of the RS14's internal consistency and construct validation, including internal structure analyses and evidence of relations to other variables, such as life satisfaction, meaning in life, psychological distress, depression and anxiety. While the psychometric properties reported in these studies were strong, it is worth noting that we were only able to find two published articles analyzing the psychometrics of the original, English RS14. The instrument has also been translated for use into dozens of languages. Psychometric analyses have been conducted on the Brazilian (Damásio et al., 2011), Finnish (Losoi et al., 2013), Polish (Surzykiewicz et al., 2019), Greek (Ntountoulaki et al., 2017), and Japanese (Nishi et al., 2010) versions of the RS14, but the only alternative language version captured in our scoping review was the Chinese version. Analyses of the psychometric properties of this version of the scale revealed similarly strong evidence of internal structure, relations to other variables, internal consistency, and test-retest reliability (Chen et al., 2020; Chung et al., 2020).

While the original scale was created among a very small, select population, both the RS and RS14 have since been used and tested for validity among a wide variety of populations, including students (Aiena et al., 2015). This suggests that the tool is suitable for use in various contexts. As far as accessibility, the authors have created a user manual

for RS and RS14 featuring compiled psychometric results from various studies, as well as guidance on ideal administration, scoring, and interpretation of results. However, users are only able to access this manual with the purchase of a licensing agreement to use the tool, representing a substantial accessibility barrier. We were able to report on scoring and interpretation guidelines here only due to their publication in Aiena and colleagues' (2015) article. On their website, the authors note that RS14's primary purpose is for graduate student research and for established researchers in the university setting. However, the original 25-item RS is available online (with purchase) as well as in their published article from 1993. The scope of the RS14 appears to be comprehensive, capturing five core elements of resilience. However, it is not possible to say whether the tool aligns with Brewer and colleagues' definition without being able to observe the individual scale items.

3.1.3. Ego-resiliency 89 scale

The 14-item Ego Resiliency 89 Scale (ER89) was developed in 1996 to measure human adaptability, defined by Block and Kremen (1996) as “the dynamic capacity of an individual to modify ego-control as a function of the demand characteristics of the environmental context in order to preserve or enhance system equilibration in young adults”. The authors developed items for the scale based on the relevant resilience literature (Kobasa, 1979; Lyons, 1991; Rutter, 1985). The authors note that they did not take a systematic approach to developing nor refining the scale, ultimately relying on the “validation of the final product” to assess its quality (Block & Kremen, 1996). Items are scored on a 4-point Likert scale ranging from 1 (*does not apply at all*) to 4 (*applies very strongly*). Ratings are summed for a composite score ranging from 14 to 56, where a higher score indicates a higher level of ego resiliency (Block & Kremen, 1996).

The psychometric properties of the ER89 were originally evaluated among a population of young adults at ages 18 and 23, with results demonstrating acceptable internal consistency and test-retest reliability and a significant relationship between ego-resiliency and IQ score (Block & Kremen, 1996). We were unable to locate any additional published evidence of validity in studies conducted by the original authors. However, the tool has since been validated across various populations,

Table 2

Instruments included in review (N = 12).

Instrument	Author(s)	Sample	n	Country
Connor-Davidson Resilience Scale (CD-RISC) 10 item	Heritage et al. (2021)	Nursing students	708	Australia and Canada
	Lee et al. (2020)	Medical students	237; 187	South Korea
	Meyer et al. (2020)	Nursing students	348	United States
	Kaye-Kauderer et al. (2019)	Medical students	579	Japan
	Mayor-Silva et al. (2021)	Nursing and Physical Therapy students	245	Spain
	Keener et al. (2021)	Nursing students	152	United States
	Chow et al. (2018)	Nursing students	678	China
	Houpy et al. (2017)	Medical students	117	United States
	Kong et al. (2016)	Nursing students	377	China
	Li et al. (2015)	Nursing students	202	China
	Chen et al., 2020	Undergraduate students	2230	China
	Zhang et al. (2018)	College students	1400	China
	Pozuelo-Carrascosa et al. (2017)	University students	770	Spain
	Aloba et al. (2016)	Nursing students	449	Nigeria
	Gerson & Fernandez (2013)	Undergraduate students	28	United States
	Salehinejad et al. (2017)	Students	80	Germany
	Sarrionadia et al., 2018	College students	696	United States and Spain
	Rios-Risquez et al., 2016	Nursing students	113	Spain
	Grande et al. (2021)	Nursing students	439	Saudi Arabia
	Eshel et al. (2021)	College students	723	Israel
	Notario-Pacheco et al. (2011)	University students	681	Spain
Connor-Davidson Resilience Scale (CD-RISC) 25 item	Wilkinson et al. (2016)	Medical students	69	New Zealand
	Li & Yang (2016)	College students	628	USA, Taiwan and China
	Sahu (2020)	Nursing students	102	India
	Shi et al. (2018)	Medical students	521	China
	He et al. (2018)	Nursing students	538	Australia
	Elizondo-Omaña et al. (2010)	Medical students	113	Mexico
			69	
	Akeman et al. (2020)	First year college students	252	United States
	Marulanda & Addington (2016)	Undergraduate students	80	Canada
	Avrech Bar et al. (2018)	Healthcare students	184	Israel
	Peng et al. (2012)	Medical students	579	China
	Allan et al., 2014	University students	1543	United Kingdom
	Bajaj and Pande (2016)	Undergraduate students	327	India
	Ramadianto et al. (2022)	Medical students	532	Indonesia
	Bacchi and Licinio (2017)	Medical and psychology students	560	Australia
	Houston et al. (2017)	College students	129	United States
	Peng et al. (2012)	Medical students	1988	China
	Hartley (2011)	Undergraduate students	605	United States
	Borji et al. (2020)	University students	240	Iran
Connor-Davidson Resilience Scale 25 item (French)	Guihard et al., 2018	Dental and medical students	1210	France
Connor-Davidson Resilience Scale 25 item (Bahasa Indonesia)	Devi et al. (2021)	Nursing students	336	Indonesia
Resilience Scale 14	Eaves & Payne (2019)	Midwifery students	150	United Kingdom
	Cénat et al. (2018)	College students	2195	France
	Zhang et al. (2019)	College students	700	China
	Shi et al. (2015)	Medical students	2925	China
	Lau et al. (2020)	College students	674	Malaysia
	Abram & Jacobowitz (2021)	Nursing students	119	United States
	Willis & Burnett. (2016)	College students	164	United States
	Coelhoso et al. (2017)	Students	313	Portugal
	Smith et al. (2022)	Nursing Students	490	United States
	Sam & Lee (2020)	Nursing students	620	India
Resilience Scale 14 (Chinese Version)	Lei et al. (2012)	College students	888	China
	Chen et al. (2020)	College students	1010	China
Ego Resilience 89 Scale	Karairmak and Figley (2017)	Undergraduate students	300	United States
	Prasad et al., 2018	Medical Students	140	India
	Buyukgoze-Kavas (2016)	Undergraduate students	415	Turkey
	Zhao et al. (2021)	Medical students	666	China
Brief Resilience Scale	Satici (2016)	Undergraduate students	186	Turkey
	Tafoya et al. (2019)	Undergraduate medical interns	15	Mexico
	Alsharif (2020)	Dental students	272	Saudi Arabia
	Yalcin et al., 2022	University students	506	Turkey
	Orkaizairre-Gomarra et al. (2020)	Nursing students	265	Spain
	Mcdermott et al. (2020)	Nursing students	933	United States
	Jordan et al. (2020)	Medical students	172	United States
	Sood & Sharma (2020)	Higher education students	173	India
	Choi et al. (2019a,b)	College students	925	Korea
	Hidalgo-Rasmussen and González-Betanzos (2019)	University students	1572; 1345	Mexico; Chile

(continued on next page)

Table 2 (continued)

Instrument	Author(s)	Sample	n	Country
Resilience Scale for Young Adults	Di Fabio and Saklofske (2018)	University students	186	Italy
	Smith et al. (2020)	Dental students	151	USA
	Wilson et al. (2019)	University students	617; 651	Canada; China
Resilience Scale for Adolescents	Stratta et al. (2015)	University students	371	Italy
Resilience Scale for Adults	Capanna et al. (2016)	Post-doctorate students	608	United States
	Pinar et al. (2018)	Midwife Students	270	Turkey
	Smith et al. (2020)	Dental students	151	United States
Resilience Appraisal Scale	Choi et al. (2019a,b)	College students	113	Korea
Psychological Resilience Scale	Xu et al. (2022)	College students	881	China
Resilience at University Scale	Turner et al. (2017)	Undergraduate students	410	Australia
Academic Resilience Scale	Cassidy (2016)	Undergraduate students	532	United Kingdom

including in Kenyan children (Ndeti et al., 2019), Swedish adults (Isaksson et al., 2021), and Chinese young adults (Chen et al., 2020; Zhao et al., 2021). Many of these studies have reported internal structure evidence through both exploratory and confirmatory factor analyses, internal consistency reliability, and relations to other variables evidence for validity. Generally, the scale has demonstrated acceptable internal consistency reliability, but inadequate model fit in confirmatory factor analyses evaluating the scale's proposed unidimensional structure.

While the ER89 has also been used to evaluate ego-resilience among post-secondary students in two other studies (Prasad et al., 2018; Zhao et al., 2021), a validation study has not been conducted among this population, therefore limiting its applicability. Though the authors' conceptualization of ego-resilience as a quality reflecting the ability to cope with stress aligns somewhat with part of Brewer and colleagues' (2019) definition, the scale was developed by conceptualizing human adaptability as a personal trait. While adaptability is indeed one facet of resilience, items on the ER89 are positioned at the individual level (i.e., *I quickly get over and recover from being startled*), and fail to address Brewer and colleagues' (2019) suggested inclusion of items assessing the capacity to draw upon social, cultural, and environmental resources in addition to individual psychological characteristics.

3.1.4. Brief Resilience Scale

The 6-item Brief Resilience Scale (BRS) was created in 2008 by Smith and colleagues. The authors' goal was to create a scale to assess the most basic meaning of resilience: "the ability to bounce back from stress" (Smith et al., 2008). Items included on the scale were selected from a larger list after receiving feedback from a research team and conducting a pilot study among a sample of university students (Smith et al., 2008). Further detail on item pool development and refinement was not shared. Items are scored on a 5-point adjectival scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*), with three items positively worded and three negatively worded. The scale is scored by reverse coding the negatively worded items and calculating the overall mean, with a higher mean indicating a higher level of resilience.

The scale was developed with as few items as possible in the interest of developing a scale assessing a unitary construct. The psychometric properties of the scale were originally explored among small samples ($n = 128, 64, 112$, and 50) from the Southwestern United States (Smith et al., 2008). Two of these studies were conducted among undergraduate university students, evaluating internal structure evidence for validity via exploratory factor analysis, and relations to other variables by investigating correlations between the BRS, CD-RISC-25, Ego Resiliency 89, and other related health outcomes such as the Brief COPE and the Mental Health Inventory (Smith et al., 2008). Exploratory analysis revealed a unitary structure. The authors also assessed the internal consistency reliability of the instrument. The scale has also been adapted for and validated in Korean and Spanish populations with similarly positive results (Choi et al., 2019a,b; Hidalgo-Rasmussen & González-Betanzos, 2019). The BRS does not comprehensively assess the

concept of resilience per Brewer and colleagues' definition. However, this is not surprising given that the authors intended to develop a concise scale designed to assess one specific aspect of resilience (Smith et al., 2008). Despite its brevity, it is possible that the BRS may be applicable in assessing resilience initiatives among post-secondary populations at a basic level (i.e., where the intention is specifically to assess the ability to "bounce back from stress") but may leave broader elements of resilience unmeasured. The BRS is available for use online at no cost in the original publication of the scale (Smith et al., 2008).

3.1.5. Resilience Scale for young adults

The Resilience Scale for Young Adults (RSYA) is based on a three-factor model of personal resilience, including mastery, relatedness, and emotional reactivity (Prince-Embury et al., 2017). The RSYA was adapted from the Resiliency Scales for Children and Adolescents, modified to suit a population of young adults attending post-secondary education, with additional items added to measure adaptability. Initial testing of the adapted version was conducted among a sample of young adult college students, with item wording modified to better suit the target population (Prince-Embury et al., 2017). A subsequent 105-item version was then piloted among a sample of Canadian university students ($n = 380$) resulting in the final 50-item version of the RSYA, consisting of ten 5-item subscales (Prince-Embury et al., 2017). Each of the 10 subscale scores is derived from the respective five items answered on a 5-point adjectival scale (0 = *never* to 4 = *almost always*), with scores ranging 0 to 20 for each subscale.

The RSYA has demonstrated strong internal consistency reliability and internal structure evidence for validity via both exploratory and confirmatory factor analyses providing support for a three-factor model (Prince-Embury et al., 2017). Evidence of relations to other variables has been provided through positive correlations between RSYA subscales and similar measures, including the Psychological Flourishing Scale and Satisfaction with Life Scale (Prince-Embury et al., 2017). At the factor level, emotional reactivity was positively associated with measures of anxiety, stress, and depression, while negative correlations were observed between these measures and factors assessing sense of mastery and relatedness (Prince-Embury et al., 2017). Further analyses conducted among a sample of Canadian and Italian university students ($n = 289$) echoed these, with the sense of mastery and relatedness subscales positively correlating with measures of emotional intelligence, life satisfaction, and psychological flourishing, and the emotional reactivity factor correlated negatively with depression, anxiety, and stress (Wilson et al., 2019).

The RSYA was designed to evaluate resilience among young adults undergoing the transition from adolescence to adulthood, specifically within the post-secondary setting. The authors aimed to define resilience through their proposed three-factor model of personal resilience, which considers sense of mastery and sense of relatedness as protective factors for personal resilience, and emotional reactivity a risk factor (Prince-Embury, 2006, 2007). This model conceptualizes resilience as a dynamic process of adaptation, aligning with Brewer and colleagues' (2019)

definition of resilience. However, despite its length, items in the scale do not touch upon all four components of psychological, social, cultural and environmental resources, suggesting that it may not provide a comprehensive assessment. We were unable to locate a publicly available version of the RSYA, suggesting that it may only be accessible through contacting the authors. This, combined with the instrument's length, may explain its relatively limited use in the literature despite its application to the post-secondary population.

3.1.6. Resilience Scale for adolescents

The Resilience Scale for Adolescents (READ) was developed to measure the protective factors of resilience, adapted from the original 41-item Resilience Scale for Adults. The tool is composed of 28 items grouped into five factors (personal competence, social competence, structured style, family cohesion and social resources). In order to adapt the scale such that it would be relevant to the adolescent context and available at an appropriate comprehension level, the original version of the READ was reviewed by adolescents. Six of the seven participants had difficulty understanding the wording and the response format. To improve comprehension, some items were reworded, and all were changed to a 5-point Likert response format (Hjemdal et al., 2006). Items on the finalized scale are scored on a 5-point scale ranging from 1 (*totally disagree*) to 5 (*totally agree*). Ratings are summed for each subscale, with a higher score indicating a higher level of resilience.

The READ was originally validated in a study of 421 adolescents. The sample was split in half, with exploratory factor analysis performed on one half and confirmatory factor analysis performed on the other, providing evidence for internal structure validation (Hjemdal et al., 2006). These analyses supported the proposed five-factor model fit, though the sample sizes used were lower than what is typically considered sufficient for factor analyses (Jackson et al., 2007). Internal consistency reliability was acceptable for each of the individual subscales. Relations to other variables evidence for validity was demonstrated through significant negative correlations between the READ and the Short Mood and Feelings Questionnaire and measures of depression and anxiety (Hjemdal et al., 2006).

The READ has been validated across various demographic samples, including Swedish and German (Janousch et al., 2020), Norwegian (van Soest et al., 2010), Italian (Stratta et al., 2012), and other adolescent populations. Seven further validation studies have been conducted on this scale (von Soest et al., 2010; Stratta et al., 2012; Ruvalcaba-Romero et al., 2014; Kelly et al., 2017; Moksnes & Haugan, 2018; Askeland et al., 2019; Pérez-Fuentes et al., 2020). These have suggested there may be issues with the five-factor, 28-item model originally proposed. Given that the majority of the factor analyses performed on the READ have been exploratory in nature, Janousch and colleagues (2020) have identified a need for further confirmatory analyses to support the internal structure of the instrument. Most of the psychometric analyses performed on this scale have been conducted among samples of high school students, making the suitability of this scale for use at the post-secondary level unclear. It is possible that the READ may perform better among younger adolescents compared to emerging adults. As the scale was designed to assess protective factors of resilience, including adaptation to stress through drawing on psychological, social, cultural, and environmental factors, it does appear to align with Brewer and colleagues' (2019) definition of resilience (Hjemdal et al., 2006). We were unable to locate a publicly available version of the scale, though it might be accessible through contacting the authors.

3.1.7. Resilience Scale for adults (RSA)

The Resilience Scale for Adults (RSA) aims to examine six intra and interpersonal protective factors that facilitate adaptation to psychosocial adversity: perception of self, planned future, social competence, family cohesion, social resources, and structured style (Friborg et al., 2003). A preliminary version was developed by Hjemdal and colleagues (2001) with item development based on existing resilience

literature classifying psychological/dispositional attributes, family support/cohesion, and external support systems as protective resources (Werner, 1989, 1993; Rutter, 1990; and Garmezy, 1993). The scale was later refined and reduced to 33 items (Friborg et al., 2003; Friborg et al., 2005), rated on a 7-point semantic differential scale ranging from 1 (*not true at all*) to 7 (*very true*). After reverse coding 17 of the items, scores are calculated for each of the subscales.

Initial psychometric analyses of the earliest versions of the RSA were conducted by Hjemdal et al. (2001) and Friborg et al. (2003), ultimately leading to the refined 33-item scale. Confirmatory factor analysis conducted by Friborg and colleagues in 2005 provided support for a five-factor model with acceptable fit statistics. Friborg and colleagues (2006) later changed the response format of the scale from adjectival to semantic differential, which resulted in lower internal consistency reliability but improved overall CFA model fit and item response theory performance (Friborg et al., 2005). The 33-item RSA has been translated into seven languages and validated across several demographic populations, including Norway (Friborg et al., 2006; Hjemdal et al., 2006), Belgium (Hjemdal et al., 2011), Brazil (Hjemdal et al., 2015), Italy, Lithuania, and South Africa (Cappana et al., 2016), with all studies demonstrating similarly strong psychometrics.

As the RSA was developed for use among adults, it may not be suitable for use among post-secondary students. Studies evaluating the psychometric properties of this scale assessed neither its performance among samples of emerging adults nor students. Therefore, although the RSA appears to be applicable across various cultural contexts, it has not been evaluated among post-secondary students, thereby limiting its applicability. The RSA examines intra and interpersonal protective factors facilitating adaptation to psychosocial adversity, aligning with Brewer and colleagues' (2019) definition. We were unable to locate a publicly available version of the scale, suggesting that it may only be accessible by contacting the authors.

3.1.8. Resilience Appraisal Scale

The 12-item Resilience Appraisal Scale (RAS) aims to evaluate an individual's appraisal of their ability to cope with emotions, solve problems, and gain social support (Johnson et al., 2010). It was developed based on the Schematic Appraisals Model of Suicide, which suggests these three types of positive self-appraisal may prevent individuals from experiencing suicidal ideation when faced with stress (Johnson et al., 2010). Johnson and colleagues (2010) conceptualized the RAS as a three-factor scale assessing emotion coping appraisal, situation coping appraisal, and social support appraisal. Items are scored on a 5-point adjectival scale ranging from 1 (*strongly agree*) to 5 (*strongly disagree*). Ratings are summed for a composite score ranging from 12 to 60, with a higher score indicating a higher level of resilience (Johnson et al., 2010).

Few studies have explored the psychometric properties of the RAS. To test the proposed three-factor internal structure of the scale, a confirmatory factor analysis was conducted using a pilot sample of students attending Manchester University (Johnson et al., 2010). Results supported a three-factor solution, and internal consistency reliabilities were high for each of the three subscales. A second study evaluated the psychometric properties of the scale among undergraduate nursing students in Spain ($n = 434$), finding similarly strong evidence of internal consistency reliability and internal structure evidence for validity through both exploratory and confirmatory factor analyses (Tur Porcar et al., 2020).

The RAS was originally developed to investigate resilience as it relates to suicidality, and therefore is likely too narrowly conceptualized to align with Brewer and colleagues' broad definition. Additionally, we were only able to find two examples of its use among post-secondary students, leaving the instrument's applicability among this population unclear. Given its original intention, it is possible that the RAS may be useful in studies investigating students' resilience related to its protective effects against suicidal ideation, but to our knowledge, this has not yet been explored. The RAS is available in both English and Spanish for

free online (Johnson et al., 2010).

3.1.9. Resilience at university scale

The Resilience at University (RAU) Scale was developed was developed to measure student resilience in university settings to fill the gap created by existing resources (Turner et al., 2017). The scale consists of 20 questions with responses ranging from 1 (*strongly disagree*) to 7 (*strongly agree*), following a 7-point adjective scale, where higher scores indicate higher resilience. The scale was adapted from the Resilience at Work (RAW) scale, with items being adjusted to better fit the university student population (i.e., changing “work” to “university”) (Turner et al., 2017). The initial RAU scale was piloted in a population of university students to assess its psychometric properties (Turner et al., 2017). Principal components analysis yielded a six-factor structure which explained 63.88% of the variance in responses. The six-factor solution closely replicated the seven-factor structure of the RAW scale. Therefore, the resulting scale was composed of 20 items and 6 subscales.

Due to its recent development, few studies have assessed its psychometrics aside from the aforementioned pilot study. Turner and colleagues tested the confirmatory factor analytic model of the RAU scale in a population of undergraduate university students, finding that while the CFA confirmed the internal structure of the scale, Cronbach’s alpha values indicated issues with the internal consistency reliability of four of the six subscales (Turner et al., 2020). It was identified that changes to four of the dimensions would help ensure that the RAU demonstrates both the validity and the reliability required for an effective scale for its intended population (Turner et al., 2017).

The RAW, and subsequently the RAU, was created to meet the limitations of other scales that the authors deemed too broad, such as like the CD-RISC and the RS-14 (Turner et al., 2017). In contrast to others, these authors approached resilience as a specific personal capacity rather than as a general personal attribute. Therefore, this scale may be too specific to fully align with all four components of Brewer and colleagues’ (2019) definition of resilience. While the scale is clearly applicable to our target population given its specific adaptation to suit post-secondary students, it was created with only university students in mind. As a result, it may not be applicable to students from other types of post-secondary institutions (i.e., colleges, institutes). Finally, we were unable to locate a publicly available version of the scale, suggesting that it may only be accessible by contacting the authors.

3.1.10. Academic Resilience Scale

The Academic Resilience Scale (ARS) was developed by Cassidy in 2016 and is a multidimensional measure consisting of 30 items. Items are ranked on a 5-point adjectival scale ranging from 1 (*likely*) to 5 (*unlikely*). A composite score is achieved by summing all responses, with higher results indicating higher resilience. Reverse coding of some items is necessary before scoring (Cassidy, 2016). Scale items are drawn from theoretically relevant concept domains including self-efficacy and self-regulated learning and reflect commonly cited definitions and dispositional attributes associated with psychological resilience (Hoge et al., 2006; Cassidy, 2016).

A study performed on a sample of undergraduate students showed evidence of strong internal consistency reliability and construct validation (Cassidy, 2016). An exploratory factor analysis suggested a three factor solution. The ARS has since been adapted and validated for use among a sample of university students from Spain (Trigueros et al., 2020). The adapted version also consists of 30 items and three factors and is rated on the same Likert scale.

The scale is narrowly focused on academic resilience, and therefore does not fully align with the proposed Brewer et al. (2019) definition of resilience. Although the scale was developed for students and the items are relevant to our target population, they are again too narrow in focus to assess components of resilience unrelated to academics. The ARS is available online at no cost (Cassidy, 2016).

4. Discussion

The purpose of this study was to fill an existing gap in the literature with respect to the quality of validated instruments used to measure resilience among post-secondary students. Our goals were to determine which instruments have been used to evaluate the concept of resilience in published studies among post-secondary students, and secondly to evaluate the quality of these instruments through an analysis of their validity, reliability, and appropriateness to the target population. Through our two-part study, we conducted a scoping review of peer-reviewed publications detailing the use of an instrument to assess post-secondary student resilience, identifying a total of 78 records that met our inclusion criteria. Following this review, we extracted the 12 identified instruments that met our inclusion criteria and systematically evaluated each in terms of suitability for use among post-secondary student populations and quality of associated psychometric evidence using specific criteria frameworks.

The majority of scales included in our review were evaluated in samples of health sciences students (i.e., nursing, medical, and dentistry students). Most articles were also from North America (Canada and the United States) or from other high-income countries, which may have occurred due to our inclusion criteria requiring the articles to be available in English. In addition, the majority of included studies were cross-sectional in nature, with few longitudinal studies being performed. Most of the instruments we reviewed were developed for use among general adult populations and were not specifically designed for use among students. However, in almost all cases, items on the tools were considered applicable given their relevance for modern day use. Furthermore, most of the instruments were moderately aligned with Brewer and colleagues’ definition of resilience, though very few evaluated all four resources that contribute to resilience (psychological, social, cultural, and environmental), as identified in this holistic definition. The weakest in terms of scope was the BRS, in part due to its brevity, but largely owing to the fact that the tool was intentionally designed with a very narrow scope. With respect to accessibility, only three of the instruments were immediately available online at no cost, while the majority of the others were available upon author request. One instrument, the RS14, was only available upon request and with a significant purchase price. As a result, we were also unable to evaluate the applicability and scope of this tool, as we were unable to access all of the items.

None of the instruments included in our review had published evidence in support of a complete psychometric analysis that included all elements recommended by the Standards. Response processes evidence for validity was rarely, if ever, evaluated. Content evidence was provided for all instruments but was weak to moderate in most cases (i.e., only students in one program approached for input, only literature referred to, no Delphi method or consensus surveys conducted). Relations to other variables and internal structure evidence for validity were the most frequently reported psychometric properties, which is not unusual, particularly with respect to preliminary validation studies. Relations to other variables evidence was the most commonly reported psychometric evidence and was strong across nearly all instruments included in the review. For several instruments, internal structure evidence was only provided in the form of exploratory factor analyses, with no confirmatory factor analyses performed (i.e., BRS, RSA). The vast majority followed a classical test theory approach to internal structure, with none exploring more modern methods, such as item response theory or generalizability theory.

Internal consistency reliability was consistently assessed across instruments but was often inappropriately reported. For example, some authors incorrectly reported a single Cronbach’s alpha coefficient for all items in a scale. This approach is inappropriate when a scale is multidimensional, as alpha will likely underestimate the true reliability of a scale due to violation of the necessary assumptions (i.e., that each test item measures the same latent trait on the same instrument) (Tavakoli and Dennick 2011). Therefore, it is more appropriate to report a single

alpha coefficient for each individual subscale on a multidimensional instrument. Similarly, the decision to base interpretations on a composite score is only appropriate for unidimensional scales: separate scores should be reported for individual subscales. For example, the authors of the RAS indicated that responses to all items should be summed to derive a composite score representing overall appraisal of one's resilience, despite the fact that the scale consists of three distinct factors: emotion coping appraisal, situation coping appraisal, and social support appraisal. It is also worth noting that the larger the number of items on an instrument, the more inflated alpha values will be, resulting in an overestimation of reliability (Tavakol and Dennick 2011). For this reason, it is common for longer instruments to produce a high alpha value, but this should be interpreted with caution. Despite the popularity of Cronbach's alpha, it is wise to evaluate reliability using more than one approach. In this study, we found that while internal consistency was assessed for all instruments, only some had been tested for test-retest reliability, which evaluates the temporal stability of a tool.

Based on our evaluation criteria, the CD-RISC emerged as the most widely used and appropriate scale, both in terms of its psychometrics and suitability for use among post-secondary students. The results of our scoping review revealed that the 10-item CD-RISC was the most often used in research assessing resilience among post-secondary students, closely followed by the 25-item version. The conceptualization of the construct of resilience used to develop the CD-RISC is consistent with the definition proposed by Brewer and colleagues (2019), with items on the scale addressing all four resources pertinent to resilience, resulting in an excellent scope rating. As one of the more recently developed scales, all items were relevant for modern use resulting in excellent applicability. Though not developed specifically for use among post-secondary students, the tool has been extensively used and validated among populations of young adults and post-secondary students (see CD-RISC User Guide at www.cd-risc.com for an extensive breakdown of validation evidence), making this tool ideal for use among our target population. The CD-RISC also presents researchers with some flexibility with respect to preferred instrument length, given its availability as both a 25- and 10-item version, both of which have demonstrated equally strong psychometric properties and are easily accessible online at no cost. With the

exception of response processes evidence, the CD-RISC has been widely and comprehensively validated, demonstrating strong content, internal structure, and relations to other variables evidence for validity as well as strong evidence of both internal consistency and test-retest reliability.

The RYSA scored the second highest based on our evaluation criteria, demonstrating its strong evidence for validity and particularly its suitability for use among post-secondary populations. Despite this tool being developed specifically for use among emerging adults making the transition to the post-secondary setting, it does not appear to have been widely used in the published literature based on our scoping review. We propose this may be due to the instrument's considerable length (50 items) at a time when many researchers value brevity in measurement tools when adopting longer surveys that assess multiple mental health-related characteristics at once. The RYSA also does not touch upon all four components of resilience as identified by Brewer and colleagues (2019), making its suitability in terms of scope only moderate. Unlike the CD-RISC, the RYSA it is not available for public use without contacting the authors and has less psychometric evidence in support of its validity and reliability. While the scant published psychometric evidence for the RYSA is strong, the CD-RISC has been comparatively more widely validated across a wide variety of student populations across regions, levels, and areas of study. Despite the RYSA being the most suitable tool included in our review for use among post-secondary populations, we recommend the use of the CD-RISC over the RYSA until further psychometric analyses have been conducted on the latter.

4.1. Limitations

There are some limitations to this review. First, given our inclusion criteria (including specific databases and time frame for publication), it is possible that articles and subsequent instruments were not available through the databases we searched. In addition, we restricted articles to published in English, which may have contributed to the majority of studies located having been conducted in English-speaking countries. We also observed that the majority of the studies captured through our review had been published in higher-income countries (i.e., United States, Canada) with less representation from non-Western and lower-

Table 3
Evaluation of instruments by psychometric and suitability evaluative criteria frameworks.

Instrument	Evidence for Validity				Evidence for Reliability		Suitability			
	Content	Response Processes	Internal Structure	Relations to other Variables	Internal Consistency	Test-retest	Population	Scope	Applicability	Accessibility
Connor-Davidson Resilience Scale – 10-item	±	x	✓	✓	✓	✓	±	✓	✓	✓
Connor-Davidson Resilience Scale – 25-item	±	x	✓	✓	✓	✓	±	✓	✓	✓
Connor-Davidson Resilience Scale – 25-item (FR)	±	x	✓	✓	✓	✓	±	✓	✓	±
Resilience Scale - 14	✓	x	✓	✓	✓	x	±	*	*	x
Resilience Scale – 14 (CH)	✓	x	✓	✓	✓	✓	±	*	*	x
Ego Resilience 89 Scale	✓	x	±	✓	±	✓	±	±	✓	±
Brief Resilience Scale	±	x	±	✓	✓	x	±	x	✓	✓
Resilience Scale for Young Adults	±	x	✓	✓	✓	✓	✓	±	✓	±
Resilience Scale for Adolescents	±	±	±	✓	±	x	±	✓	✓	±
Resilience Scale for Adults	x	x	✓	x	±	✓	✓	✓	✓	±
Resilience Appraisal Scale	x	x	✓	x	±	✓	±	±	✓	±
Resilience at University Scale	±	x	✓	x	✓	x	✓	✓	✓	±
Academic Resilience Scale	±	x	±	x	✓	x	✓	±	✓	✓

Notes: ✓ Indicates the scale met all evaluation criteria, ± indicates criteria were partially met, x indicates these criteria were not met, and * indicates unable to assess.

income countries. In addition, the development and validation of the majority of included scales was conducted among samples of students studying in the health science field (i.e., medicine, nursing, dentistry), perhaps due to the fact that resilience is a construct often studied alongside stress, injury, and other health outcomes.

Notably, none of the instruments included in our review had an associated comprehensive psychometric assessment published that included all types of evidence for validity as per the *Standards for Educational and Psychological Testing* (i.e., content, response processes, internal structure, and relations to other variables). Finally, none of the scales included in our review met all of the criteria identified in Table 3, suggesting there remain gaps in the quality of existing instruments designed to assess resilience.

5. Conclusion

The results of this review indicate that there does not appear to be a need to develop a new instrument uniquely designed to assess resilience among post-secondary student populations. The root conceptualization of resilience as the ability to bounce back from adversity was consistent across all instruments included in our review. This suggests that the variable factor of resilience based on target population may lie in the latter half of Brewer and colleagues' definition: the ability to access and/or draw upon psychological, social, cultural, and environmental resources (Brewer et al., 2019). Researchers working in the post-secondary mental health setting should consider measuring not only resilience, but the environmental risks (i.e., stressors) and barriers to help-seeking (i.e., environmental/structural, social, cultural) at play within the post-secondary setting that may be unique to students compared to the general adult population.

The need to bolster post-secondary students' resilience has increasingly been identified as a priority, but conclusions around how best to do so remain unclear. As has been recommended by frameworks including the National Standard of Canada for Mental Health and Well-Being for Post-Secondary Students (Mental Health Commission of Canada, 2020) and the Okanagan Charter (International Conference on Health Promoting Universities & colleges, 2015), post-secondary institutions should aim to adopt "whole-campus", holistic mental health frameworks that address all four key resources for the development of resilience, including psychological, social, cultural, and environmental factors. As always with questions of measurement, when evaluating the efficacy of these frameworks and/or initiatives, it is imperative that the correct tool is used. Researchers and program evaluators should closely consider the

goals of the program or initiative, as well as the components of resilience they are aiming to measure. If the focus is primarily on assessing post-secondary student resilience in a holistic manner that aligns with Brewer and colleagues' definition, a more comprehensive instrument such as the RYSA or 25-item CD-RISC is recommended. However, if assessing resilience is only one part of a broader project aiming to evaluate several mental health-related constructs, a brief, but psychometrically strong tool would allow researchers some flexibility in survey instrument length without sacrificing quality of measurement. Overall, we recommend the use of the CD-RISC due to its suitability for the post-secondary population, comprehensive assessment of the construct of resilience, and strong psychometric properties.

Declarations of interest

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Ethical statement

Ethics approval was not required for this study per TCPS-2 requirements.

Author contributions

BL was the primary investigator on this project, developed the conceptual idea for the study, supervised data extraction and analysis, and contributed to the writing and reviewing of the manuscript. AE took the lead on data extraction and analysis, actively contributed to the interpretation of results, writing and reviewing of the manuscript, as well as its preparation for submission. HS held a supervisory role in this project reviewing analyses, interpretation of results, and reviewing the manuscript. All authors have reviewed and approved the final version of the manuscript.

Data availability

No data was used for the research described in the article.

Appendix A. Psychometric Evaluative Criteria Framework

Evaluation Criteria	Good (✓)	Adequate (±)	Inadequate (×)
Evidence for Validity			
Content	Strong evidence of thoughtful item construction incorporating feedback from user group, literature, and expert input Delphi method or consensus survey used during item refinement demonstrating I-CVIs >0.7	Evidence of efforts made to incorporate feedback from some combination of user group, literature, and/or expert input during item development Results of Delphi method or consensus survey weak (I-CVIs <0.6) or not reported	Items developed based solely on literature OR item development process not described No Delphi method or consensus survey reported
Response Processes	Analysis of thorough response processes testing during item refinement	Analysis of response processes testing weakly reported	Response processes testing not reported
Internal Structure	EFA conducted using appropriate sample size (>300) CFA conducted to confirm internal structure, demonstrating acceptable goodness of fit statistics	EFA conducted using inappropriate sample size (<300) OR demonstrates weak results CFA demonstrates poor goodness of fit statistics	EFA conducted using inappropriate sample size (<300) OR is not reported CFA not reported
Relations to other Variables	Results of comparisons to other like constructs align with directional hypotheses	Comparisons to other like constructs provided are weakly aligned with directional hypotheses	Not provided OR results not aligned with directional hypotheses

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Evaluation Criteria	Good (✓)	Adequate (±)	Inadequate (×)
<i>Evidence for Reliability</i>			
Internal Consistency	Coefficient ≥ 0.8 Coefficient appropriately measured (i.e., provided for individual subscales)	Coefficient $\geq 0.7 - < 0.8$ Coefficient appropriately measured	Coefficient < 0.7 Coefficient inappropriately measured OR not reported
Test-retest Reliability	Coefficient ≥ 0.8 Time frame appropriate (2–4 weeks)	Coefficient $\geq 0.7 - < 0.8$ Time frame inappropriate	Coefficient < 0.6 Not reported

Appendix B. Suitability Evaluative Criteria Framework

Evaluation Criteria	Good (✓)	Adequate (±)	Inadequate (×)
Population	Tool created specifically for students and/or youth, young adults, or emerging adults	Tool created for general use among a variety of populations, including youth, young adults, or emerging adults	Tool designed for a specific population (i.e., clinical) and was not intended for use among youth, young adults, or emerging adults
Scope	Tool creators' definition of resilience aligns well with that of Brewer et al., 2019 Items in instrument cover the full scope of "resilience"	Tool creators' definition of resilience somewhat aligns with that of Brewer et al., 2019 Items in instrument cover most of the scope of "resilience"	Tool creators' definition of resilience does not align with that of Brewer et al., 2019 Items in instrument are narrow and do not cover the full scope of "resilience"
Applicability	Items on the instrument are relevant for modern day use	Items on the instrument are somewhat relevant for modern day use	Items on the instrument are irrelevant for modern day use
Accessibility	Instrument is easily and freely accessible	Instrument is freely accessible upon author request	Instrument is difficult to access (i.e., high cost) OR inaccessible

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