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SYSTEMATIC REVIEW

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# Resilience revisited: a systematic review and synthesis of Non-Suicidal Self-Injury (NSSI) and its relation with resilience

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## Abstract

**Background** The aim of the current study is to examine the relationship between nonsuicidal self-injury (NSSI) and resilience. Resilience has been identified as a critical area for further investigation in the context of NSSI. Resilience has been conceptualized in different ways over the years, from psychological resilience, with a focus on the individual's problem/deficiency, into a dynamic, cultural, interactive process in which people's biological, psychological, social, and ecological systems work together to help them cope with challenges and maintain or improve their mental well-being.

**Method** For this systematic review was searched within PubMed, PsycINFO, the Cochrane Library, and Web of Science for currently published studies on the relationship between NSSI and resilience to provide a summary, following the Preferred Reporting Items for Meta-analysis and Meta-Analysis. Second, it determines the magnitude of this relationship by calculating a random effects size, using the meta-package of R.

**Results** Included were 17 studies with a total sample size of 12,273 participants ($M_{age}$ = 17.56, range: 12.93–27.50, SD = 3.95; female: 59.5%) and a NSSI sample size of 4,767 (38.8%). The pooled results indicate a small to moderate relationship between resilience and NSSI, with a random effects model effect size of 0.28 (95% CI: 0.10; 0.47), with higher levels or the presence of NSSI associated with lower levels of resilience. Most studies measured psychological resilience. Several reporting the moderator and mediator function of resilience, whereby higher resilience reduces the odds of developing NSSI in the case of stressful or traumatic events. A minority of studies reported effect sizes per resilience factor. Of which problem solving/coping and emotional reactivity were predominantly reported.

**Conclusions** Resilience is related to NSSI. However, it also shows that resilience is mostly measured as a psychological and individual concept. This is contrary to the multimodal perspective of resilience as well as the multimodal and non-linear nature of the recovery process of NSSI. Therefor this review highlights the need for a holistic approach with a shift in focus to a multimodal perspective. More research is needed to understand the role of resilience within the nonlinear recovery process. This research should include the voices of people with lived experience.

**Keywords** Nonsuicidal self-injury, Resilience

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## Introduction

Nonsuicidal self-injury (NSSI) is a significant public health concern [5, 82] that places a great burden on families and society [39] with evidence suggesting a rising prevalence [35, 47, 60, 111, 119], There are indications that the Covid period has increased the prevalence of NSSI [71, 107, 119], and there is even evidence of a lingering effect [118]. This likelihood is related to what is known: The prevalence of mental health problems such as anxiety and suicidality in general has increaed as a result of Covid and the policies surrounding it [8, 81, 103]. NSSI typically stops within a few years. However, in 20% of cases, NSSI lasts more than five years [57]. Although NSSI differs from suicidal self-injury, a history of NSSI is a risk factor for future suicidal behavior [48, 104, 112].

Given the prevalence of NSSI among adolescents and its association with suicidal behavior, the development of effective interventions for this age group is of paramount importance [92]. Although there is no gold standard for the treatment of self-injury, several interventions have shown promise in reducing or stopping NSSI [12, 94]. On the other hand, a recent meta-analysis by Fox and colleagues [25] revealed that, on average, treatment, compared to placebo, or another active treatment did not significantly reduce the incidence of or recovery from NSSI (RR = 1.11 [0.98, 1.27], $p$ = .11). Therefore, improving our understanding of the mechanisms underlying the onset and cessation of NSSI is essential for developing effective prevention and intervention strategies.

NSSI is often used to cope with personal and social issues [15, 49, 74]. NSSI is a multifaceted behavior influenced by both proximal and distal events, suggesting a need for a multifaceted approach to recovery that addresses the individual and contextual aspects associated with the behavior [53, 115].

Resilience, defined as a dynamic process of the interplay between individual and contextual aspects [61], plays a critical role in recovery from mental health problems [79, 101] and NSSI [46, 51, 52, 115].

Consequently, resilience is a pivotal area for further investigation in the context of NSSI [58]. Therefore, the aim of the current systematic review and meta-analyses is to examine the relationship between resilience and NSSI. This is important because knowing more about resilience and its factors will help support individuals, families, and institutions in using them to heal, recover, and grow [58].

### NSSI

The International Society for the Study of Self-injury [44] defines NSSI as "deliberate, self-directed damage of body tissue without suicidal intent and for purposes not socially or culturally sanctioned". With respect to lifetime prevalence, approximately 22% of children and/or adolescents (22,6% [32], 22,1%, [56]) and 13.4% of emerging adults [88] reported having self-injured at least once in their life. In comparison, 5% of adults reported having self-injured at least once in their life [50, 88]. With respect to 12-month prevalence, approximately 19% of children and/or adolescents (19,5%, [56] 18,6%, [32]), and 3–8% of the emerging adults [87] reported having self-injured during the past year. In comparison, 0.9% of adults reported having self-injured in the year preceding the inquiry [50].

Increasing evidence suggests that NSSI is not an individual problem or individual maladaptive coping, but is embedded in interactions with the social environment [23, 83]. Feelings of marginalization or social insecurity, as in the case of LGBTIQ + people [31], and other social challenges may influence the reasons for and prevalence of NSSI [7, 114, 119]. Several explanatory models have been developed to explain the factors and processes that influence NSSI. While these models have different etiologies and emphases, difficulties with emotional regulation and social competence have been identified by most models [38, 43, 55, 72, 73, 86]. Strengthening emotion regulation and other intrapersonal factors (e.g., self-efficacy, identifying strengths) and social competence and other interpersonal factors (e.g., help-seeking skills, providing social support) are important components of a multifactorial approach to prevent, stop, and recover from NSSI [17, 21, 22, 38, 47, 53, 93]. Recovery from NSSI involves more than just the cessation of self-injurious behaviors. Recovery involves identifying alternative coping mechanisms and developing new perspectives on oneself. Individuals can cultivate personal strength, meaning, and resilience [53]. Those with first-hand experience often say that resilience is key to recovery [46, 54, 68, 80, 89, 113]. Given the central role of resilience, its meaning must be clarified.

### Resilience

Resilience is considered a dynamic, cultural, interactive bio-psycho-socioecological process [61, 101, 115]. This systemic interactive conceptualization has shifted focus from the individual and his inner resources (i.e. psychological resilience) in the early resilience research to the individual and external resources and context (i.e. systemic, interactive resilience).

Over the years, there has been increasing reflection and research on what is meant by resilience and what factors and circumstances influence a perceived higher or lower level of resilience. Consequently, resilience has over the years been conceptualized in various ways, i.e., psychological or ego resilience, resilience resources, resilience as

protective factors, resilience as an outcome, or resilience as a socio-ecological process [1, 24, 27, 61, 116].

Initially, the focus of resilience was the individual level; psychological or ego resilience. Psychological resilience or ego resilience consists of an internal (stable) set of individual personality traits that help us adapt to challenges [18, 62]. Instead of internal factors, resilience resources refer to external factors, such as mentors and opportunity structures [24, 121]. Both internal and external factors are referred to when considering resilience as protective factors. In this view resilience is the moderating effect of promotive factors, including assets and resources, on negative effects in predicting negative outcomes [121]. Instead of a moderator, resilience can also be seen as an outcome or so called manifested resilience. This is the positive adaptation to adversity regardless of how it is defined as resolved [61].

Over the years, the conceptualization of resilience has evolved into a process that combines psychological resilience, resilience resources, and protective factors into a biopsychosocioecological process [2, 27, 30, 62, 97, 99, 101, 106, 116]. Resilience has thereby shifted from an individual problem/deficiency to a dynamic, cultural, interactive process [61]. Ultimately, it is conceptualized as the way in which people's biological, psychological, social, and ecological systems work together to help them deal with challenges and maintain or improve their mental well-being [101].

Interest in the relationship between NSSI and resilience is increasing [47, 91]. The relationship between resilience and self-harm is complex. Societal disruptions can have an effect on resilience at both individual and systemic level, which in its turn may decrease or increase the risk of developing self-injurious behaviors when under significant stress [115]. Either way, NSSI may indicate reduced resilience and act as a barrier to recovery [96, 100]. In any case, strengthening resilience is an important component of the recovery process [46, 53]. Therefore, the aim of the current systematic review and meta-analyses is to examine the relationship between resilience and NSSI. This is important because knowing more about resilience and its factors will help support individuals, families, and institutions in using them to heal, recover, and grow [58].

## Method

This systematic review is presented in accordance with the Preferred Reporting Items for Meta-analysis and Meta-Analysis (PRISMA) standards [66]. Appendix A provides the PRISMA checklist. The review protocol was preregistered on 22 September 2022 in PROSPERO (CRD42022362058). Amendments to the final review from the registered protocol are explained in Supplementary Content 1. The Human Ethics and Consent to Participate declarations are not applicable.

### Study selection

#### *Formulation of the research question*

The population, exposure, outcome (PEO) framework was used to develop an operational strategy [67]. The following research question was posed: What is currently understood about the relationship between resilience (O) in individuals across a broad age range (P) who have experience (or experience) with NSSI (E), expressed in effect sizes?

#### *Search strategy*

The search strategy was developed in collaboration with a university librarian from Leiden University Medical Center (LUMC). It comprises a combination of key terms and MESH terms related to NSSI and resilience. Prior to the final analysis, searches were rerun following the Peer Review of Electronic Search Strategies (PRESS) guidelines for meta-analysis [64]. The initial searches for relevant literature on NSSI and related behaviors used the following keywords: self-harm, self-injury, DSH, NSSI, self-mutilation, self-injurious behaviors/behaviors, resilience, and effect. A librarian further refined and verified the searches via search equations. The searches were performed on 9 September 2022 and updated on 6 June 2023 and again on 28 February 2024 and 29 August 2024. The databases searched included PubMed, PsycINFO, the Cochrane Library, and Web of Science, using the following search string: ("Self-Injurious Behavior"[MeSH Terms] OR "deliberate self harm" OR "self$harm" OR "self-injury" OR "self injury" OR "parasuicide" OR "self-destructive behavior" OR "self mutilation" OR "zelfbeschadig*" OR "zelfverwond*" OR "automutilat*") AND ("Resilience, Psychological"[MeSH Terms] OR "resilience" OR "resilient" OR "resiliency") AND ("Association"[MeSH Terms] OR "relation*" Or "relatie*" OR "related" OR "gerelater*" OR "predict*" OR "voorspel*" OR "predictor*"OR "voorspeller*" OR "determinant*" OR "correlat*" OR "correlate*" OR "cause*" OR "oorza*" OR "association*" OR "link*"). Appendix B provides the full search strategies for each specific database, registers and websites, including any filters and limits used.

The search results were limited to: (i) English- and Dutch-language publications and (ii) peer-reviewed journals, including quantitative and mixed-method studies, as well as graduate-level theses, published up until August 29 th· 2024. Additional literature was identified by screening the reference lists of the included studies and consulting experts in the field. The searches were performed in both English and Dutch. Two or

three members of the review team independently screened the titles and abstracts of the studies, with some use of Rayyan software [75]. Disagreements were resolved by consensus. The full texts of the remaining articles were independently assessed against the inclusion criteria. This search strategy yielded a total of 328 articles, of which 279 were unique reports. Only primary studies for which the necessary data could be obtained were included.

#### *Inclusion and exclusion criteria*

Studies were included if they met the following criteria: 1) they focused on individuals who have experienced episodes of NSSI, 2) they focused on resilience, 3) NSSI was assessed separately from other constructs (i.e., suicidality and other risky behaviors); and 4) they described effect sizes; quantitative data were presented on the association between resilience and NSSI. The exclusion criteria were as follows: 1) studies that focused on individuals with intellectual disabilities who self-harm and 2) studies that included only single episodes of NSSI.

### Data extraction and quality appraisal

A data extraction form based on the Joanna Briggs Institute (JBI) Manual for Evidence Synthesis [67] was used. The abstracted data included, among other data, citation details, country, demographic sample characteristics, NSSI definitions, resilience definitions, sampling strategies, study designs, utilized NSSI and resilience measurement instruments, and adjustments for confounding factors. Four subtypes or conceptions of resilience are predefined on the basis of the extant literature: psychological resilience [62], resilience as a protective factor [24], resilience resources [121], and resilience as an outcome [61]. Both descriptive data and effect sizes were extracted. If applicable, the measured components of resilience and the NSSI characteristics of the study populations were extracted. Additionally, since resilience is often mentioned as a mediator or moderator between an adverse event or mental health problem and NSSI, when applicable and available, these effects were extracted.

The quality of the individual studies was evaluated via standardized checklists for cross-sectional, prevalence, and cohort studies from the JBI [67]. To evaluate the described quality of the included papers, a ranking system was implemented with three categories: high quality (8–10/10 items checked), medium quality (3–7/10 checked), or low quality (< 3/10) for a checklist consisting of ten items [3]. Any discrepancies were resolved through consensus between the authors.

### Data analysis

In accordance with the guidelines set forth in the Cochrane Handbook [20, 42], the findings are presented in a meticulous and systematic manner. Whenever feasible, participants with a history of suicide attempts were excluded from the analyses to facilitate the assessment of the distinctive association between NSSI and resilience. This approach was employed in studies that presented resilience data for distinct groups, including those with no NSSI history, those with NSSI history only, and those with both NSSI and suicide attempt history. In such instances, data for the former two groups were included, whereas data for the latter group were excluded.

To investigate the hypothesized low levels of resilience associated with NSSI, the effect sizes of the individual studies were collected. Thereafter, the observed effect sizes were quantified via Cohen's d, in accordance with the effect size calculation and conversion formulas built into R via the "meta" package in R (version 4.2.3) [37, 65].

## Results

### Study selection and sample characteristics

A total of 279 articles were identified through database and register searches enriched with snowballing via citation searching, expert consultation, and national knowledge institutes such as the National Health Service (NHS) (k = 27). Figure 1 presents the PRISMA flowchart, which provides a summary of the search process.

A total of 17 aggregated studies were included for further analysis, with a total sample size of 12,273 participants ($M_{age}$ = 17.56, range: 12.93—27.50, SD = 3.95; female: 59.5%) and a NSSI sample size of 4,767 (38.8%). Table 1 provides the descriptive characteristics of the included studies.

Six studies were conducted in Asia, followed by North America (5), Europe (4) and Oceania (2). Most studies (14) were cross-sectional, and three were cohort studies. Most studies were community-based (13), followed by inpatient (2) and mixed (2) study populations. Most often, NSSI is defined NSSI as damage restricted to body tissue (14); the remaining three do not make a restriction to the body tissue but generally refer to self-injury without suicidal intent. Psychological resilience was the subject of inquiry in the majority of the studies (15/17).

### Quality appraisal and ethics

The majority of the papers (14/17) were appraised with a medium quality in terms of their research methodology, whereas 3 were appraised with a high-quality description of their research methodology. The primary distinction between medium- and high-quality papers was the absence of a description of the identification

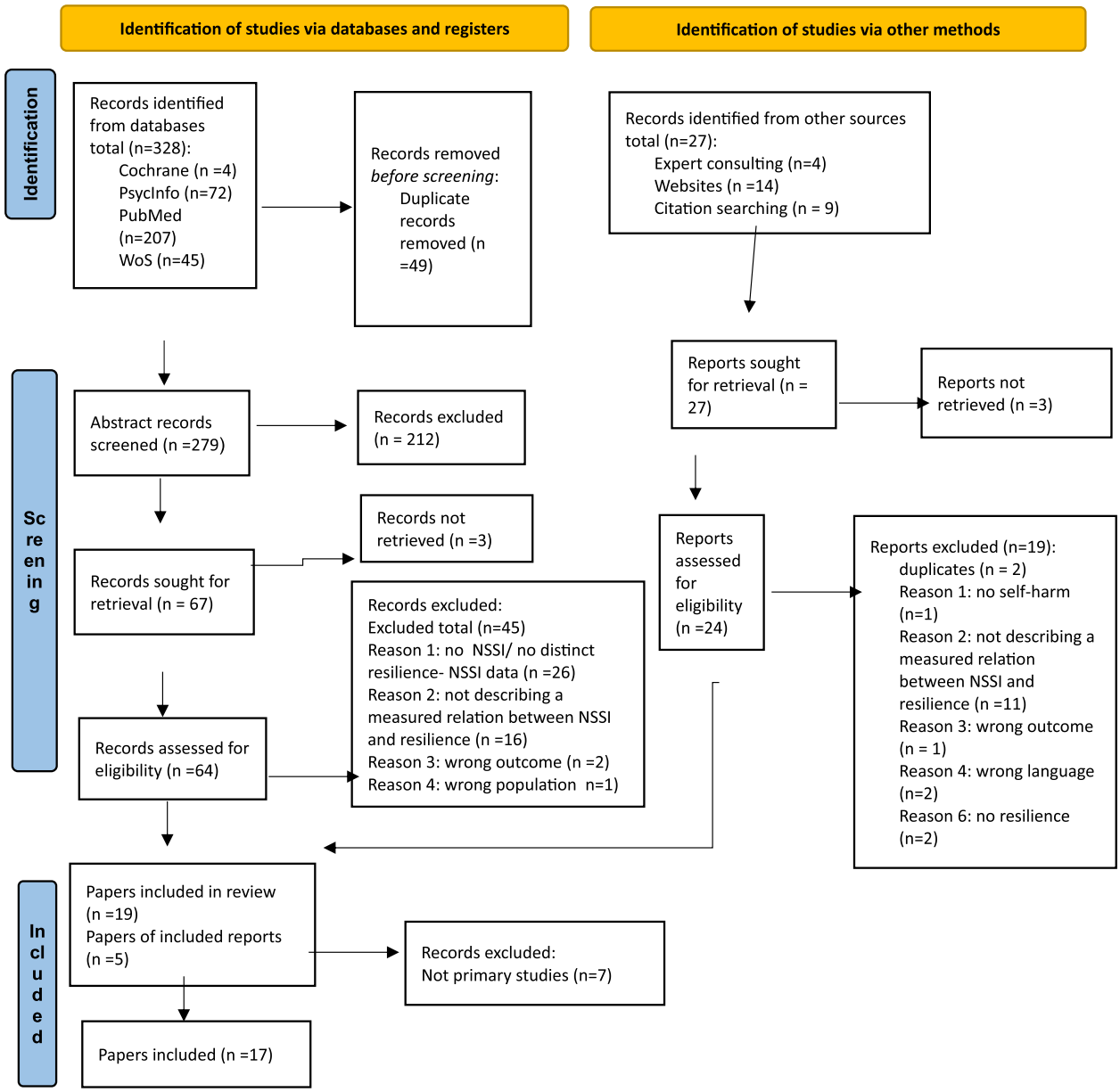


**Fig. 1** Prisma flowchart [76]

of confounding factors and, consequently, strategies to address them Appendix C provides the quality appraisal for each paper. All included studies provided an ethics statement. These statements are included in Table 1.

## NSSI

To measure NSSI (Table 1), the most frequently used instruments were (versions of) the Deliberate Self-Harm Inventory (DSHI, 3/17; [29, 59, 109]) and (translated versions of) the Functional Assessment of Self-Mutilation (FASM, 3/17: [14, 28, 120]). Additionally, several studies (5/17) did not utilize a specific scale to assess NSSI but rather employed one or more proprietary or nonstandard questions sometimes derived from an existing instrument [9, 11, 16, 19, 63].

## Resilience

A majority of the papers (15/17) employed psychological resilience, followed by resilience resources (1) and a combination of both psychological resilience and resilience resources (1).

**Table 1** Descriptive characteristics of the included studies

| Study | Total (N) | NSSI (n) | Age (M, SD)[a] | % female | Nationality | Study population | Design | NSSI definition | NSSI measure | Resilience definition | Resilience measure | Distinct reported resilience dimensions/ factors | Ethics statement |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Brennan et al. (2017) [9] | 83 | 34 | 19–70 | 40 | North-America | Transgender and gender-nonconforming adults | Cross-sectional study | Self-injury without suicidal intent | Proprietary item(s) | NR | GMSR (Gender Minority Stress and Resilience measure) | | Consent provided Study procedures approved by Board |
| Bunting et al. (2023) [11] | 1299 | 111 | 14.20 (2.58) | 48.2 | Europe | Adolescents and young adults from the general population | Cross-sectional study | Body tissue without conscious suicidal intent | Proprietary item(s)[c] | Positive factors that have a direct and independent promotive effect on an outcome that is separate from the risk factor and acts in the opposite direction | BCE (Benevolent Childhood Experiences Scale) | | Ethical approval by Ethics Committee |
| Calvete et al. (2017) [14] | 1257 | 613 | 15.18 (0.94) | 50.6 | Europe | Adolescent secondary school students | Cohort Study | Self-injury without suicidal intent | FASM (Functional Assessment of Self-Mutilation)[d] | NR | MAAS-A (Mindful Attention Awareness Scale-Adolescents) | | Ethical approval by Ethics Committee |
| Cheng et al. (2024) [16] | 132 | 61 | 15.00 (1.00) | 61 | Asia | Adolescent inpatients from a hospital mental health department engaging in NSSI | Cohort Study | Body tissue without conscious suicidal intent | Proprietary item(s)[e] | A positive personality trait that enables individuals to effectively deal with adverse and stressful situations | CD-RISC[g] (Connor-Davidson Resilience Scale) | | Consent provided Study procedures approved by Board |
| Covello (2013) [19] | 23 | 16 | 15.13 (1.18) | 43.5 | North-America | Adolescents in residential treatment | Cross-sectional study | Body tissue without conscious suicidal intent | Proprietary item(s) | Ability to weather adversity or to bounce back from a negative experience | RSCA (Resiliency Scales for Children and Adolescents)[h] | Sense of mastery Emotion regulation sense of relatedness | Consent provided |

**Table 1** (continued)

| Study | Total (N) | NSSI (n) | Age (M, SD)[a] | % female | Nationality | Study population | Design | NSSI definition | NSSI measure | Resilience definition | Resilience measure | Distinct reported resilience dimensions/ factors | Ethics statement |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gao et al. (2024) [28] | 596 | 364 | 14.96 (1.84) | 64 | Asia | Adolescents diagnosed with and treated for depression | Cross-sectional study | Body tissue without conscious suicidal intent | C-FASM (Chinese version of the Functional Assessment of Self-Mutilation) | An individual's ability to adapt positively to adversity | CD-RISC (Connor-Davidson Resilience Scale) | | Ethical approval by Ethics Committee |
| Garisch and Wilson (2015) [29] | 1162 | 566 | 16.35 (0.62) | 48 | Oceania | Adolescent secondary school students | Cohort Study | Body tissue without conscious suicidal intent | DSHI-s (Deliberate Self-Harm Inventory – Short form) | A personal characteristic that enhances individual adaptation | RS (Resilience Scale for College Students) | | Ethical approval by Ethics Committee |
| Gonçalves et al. (2023) [33] | 385 | 90 | 20.71 (2.80) | 85 | Europe | Portuguese college students (without NSSI, past NSSI, and current NSSI) | Cross-sectional study | Body tissue without conscious suicidal intent | SIQ-TR-SF (Self-Injury Questionnaire - Treatment Related – Short Form)[d] | The capacity of the individual to adapt successfully to adverse conditions that constitute risk for the well-being | RS[d] (Resilience Scale for College Students) | Self-Discipline<br>Optimism<br>Solving Problems<br>Personal Competence<br>Autonomy | Ethical approval by Ethics Committee |
| Guérin-Marion et al. (2023) [36] | 922 | 166 | 18.89 (1.52) | 83.3 | North-America | University students with a history of life-time NSSI | Cross-sectional study | Body tissue without conscious suicidal intent | Osi (Ottawa self-injury inventory) | A person's perception of its own ability to manage adversity and stress | BRS (Brief Resilience Scale) | | Consent provided<br>Ethical approval by Ethics Committee |
| He and Xiang (2022) [41] | 1951 | -[b] | 12.93 (2.54) | 49 | Asia | Primary and secondary students | Cross-sectional study | Body tissue without conscious suicidal intent | Nonsuicidal self-injury scale | The dynamic adaptation to adversity | CD-RISC [9] (Connor-Davidson Resilience Scale) | | Consent provided<br>Ethical approval by Ethics Committee. The data were partly derived from the ongoing project "Early Adverse Environment Influences Cognitive Affective Mechanism"; it unclear how ethics were handled within this ongoing project |

**Table 1** (continued)

| Study | Total (N) | NSSI (n) | Age (M, SD)[a] | % female | Nationality | Study population | Design | NSSI definition | NSSI measure | Resilience definition | Resilience measure | Distinct reported resilience dimensions/ factors | Ethics statement |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Madden (2008) [59] | 285 | 67 | 19.10 | 58.6 | North-America | Undergraduate residence hall students | Cross-sectional study | Body tissue without conscious suicidal intent | DSHI (deliberate self-harm inventory) | The ability to function effectively while experiencing high levels of stress, or as the ability to quickly resume adaptive functioning following exposure to highly stressful situations | LOT-R (Life Orientation Test-Revised); TALCS (Trice Academic Locus of Control Scale); ASES (Academic Self-Efficacy Scale) | Optimism Self-efficacy Locus of control | Clearance was obtained from the Institutional Review Board (IRB) and the University's IRB |
| McDowell et al. (2019) [63] | 148 | 46 | 27.50 (5.70) | 23.3 | North-America | Trans-masculine adults | Cross-sectional study | Body tissue without conscious suicidal intent | Proprietary item(s)[f] | Recovering, coping, or adapting in the face of adversity | BRS (Brief Resilience Scale)[l] | | Consent provided Study procedures approved by the Institutional Review Board (IRB) |
| Nagra et al. (2016) [69] | 323 | 165 | 22.86 (7.62) | 88.2 | Europe | Participants recruited from self-harm support forum | Cross-sectional study | Self-injury without suicidal intent | DSHBQ (Deliberate Self-harm Behaviors Questionnaire) | An individual's positive self-appraisals | RAS (Resilience Appraisal Scale) | Problem-solving Emotion regulation Support Seeking | Consent provided Ethical approval by Ethics Committee |
| Watson and Tatnell (2022) [108] | 330 | 211 | 22.00 (3.63) | 62 | Oceania | Young adults from the LGBTQIA + community | Cross-sectional study | Body tissue without conscious suicidal intent | ISAS (Inventory of Statements about Self-Injury) | Continued positive adaptation to one's environment and circumstances even Through adversity | RSA (Resilience Scale for Adults) | | Consent was implied by starting the survey Ethical approval by Ethics Committee |
| Wei et al. (2022) [109] | 643 | 237 | 15.91 (0.74) | 52.1 | Asia | Adolescent middle school students | Cross-sectional study | Body tissue without conscious suicidal intent | DSHI (deliberate self-harm inventory) | An individual's ability to positively adapt to the Environment even through adversity | RSCA (Resiliency Scales for Children and Adolescents) | | Consent provided Ethical approval by Ethics Committee |

**Table 1** (continued)

| Study | Total (N) | NSSI (n) | Age (M, SD)[a] | % female | Nationality | Study population | Design | NSSI definition | NSSI measure | Resilience definition | Resilience measure | Distinct reported resilience dimensions/ factors | Ethics statement |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Weng et al. (2024) [110] | 391 | 238 | 13–18 | 76 | Asia | Adolescents recruited from a hospital psychology department with major depressive disorder | Cross-sectional study | Body tissue without conscious suicidal intent | Osic (ottawa self-injury inventory chinese revised edition) | The ability for individuals to adapt quickly to adversity and provide a flexible response to life stress | CD-RISC [g] (Connor-Davidson Resilience Scale) | | Consent provided Ethical approval by Ethics Committee |
| Zhang et al. (2023) [120] | 2343 | 1782 | 14.99 (1.65) | 77.9 | Asia | Inpatient and outpatient adolescents suffering from depression | Cross-sectional study | Body tissue without conscious suicidal intent | FASM (Functional Assessment of Self-Mutilation) | A person's mental ability and internal resource by means of a self-regulating dynamic process | CD-RISC- 10[g] (10-item Connor-Davidson Resilience Scale | | Consent provided Ethical approval by Ethics Committee |

[a] Where mean age was not provided, the age range is presented

[b] Total NSSI population was not presented

[c] Selected from the DSHI (Deliberate Self-Harm Inventory)

[d] Spanish version

[e] Selected from the OSI (Ottawa Self-Injury Inventory)

[f] Item based on the Self-Injury Questionnaire

[g] Chinese version

[h] Only the subscales mastery, relatedness and emotional reactivity

[i] Four selected items

Twelve different questionnaires were used. Three questionnaires were used most frequently: the Connor-Davidson Resilience Scale (CD-RISC), the Resilience Scale for Children and Adolescents (RSCA), and the Resilience Scale (RS) developed by Prince-Embury in 2007 (Table 1).

The instruments used consist of some overlapping and some distinct resilience factors (Table 2). Individual factors are more common than social factors. Emotional reactivity and regulation were measured most frequently, along with coping and social connections.

**Relation resilience and NSSI**

Higher levels or the presence of NSSI are associated with lower levels of resilience. The pooled results indicate a small to moderate relationship between resilience and NSSI, with a random effects model effect size of 0.28 (95% CI: 0.10; 0.47) and a fixed effect of 0.17 for the relationship between resilience and NSSI. Tables 3 and 4 summarizes both the main and additional analyses. Figure 2 provides a forest plot of the main analysis.

The between-study heterogeneity variance was estimated at $tau^2 = 0.11$ (95% CI: 0.05–0.29), with an $I^2$ value of 91.7% (95% CI: 88.2%– 94.1%). The magnitude of the $I^2$ value indicates a considerable heterogeneity.

**Table 2** Resilient factors per instrument

| Instrument | Resilient Factors | | References |
|---|---|---|---|
| | Individual | Social | |
| BCE | Safe & Secure Positive Childhood Experiences<br>Pleasurable & Predictive Quality Of Life<br>Positive Self-Perceptions | Support External To Family | Narayan et al. (2018) [70] |
| BRS | Ability To Bounce Back | | Smith et al. (2008) [84] |
| CD-RISC | Hardiness<br>Faith<br>Persistence | Social Support/Purpose | Connor and Davidson (2003) [18] |
| CD-RISC- 10 | Hardiness<br>Persistence | | Campbell-Sills and Stein (2007) [13] |
| GMSR | Gender-Related Discrimination<br>Gender-Related Rejection<br>Gender-Related Victimization<br>Non affirmation Of Gender Identity<br>Internalized Transphobia<br>Negative Expectations For Future Events<br>Nondisclosure<br>Pride | Community Connectedness | Testa et al. (2015) [90] |
| MAAS-A | Presence or absence of attention to and awareness of what is occurring in the presence | | Brown et al. (2011) [10] |
| RAS | Emotion Coping<br>Situational Coping | Social Support | Johnson et al. (2010) [45] |
| RS | Personal Competence<br>Acceptance Of Life And Self | | Wagnild and Young (1993) [105] |
| RSA | Personal Competence<br>Personal Structure | Social Competence<br>Family Coherence<br>Social Support | Friborg et al. (2003) [26] |
| RSCA | Sense Of Mastery<br>Emotional Reactivity | Sense Of Relatedness | Prince-Embury and Courville (2008) [77] |

**Table 3** Main and additional analyses

| | *g* | 95%CI | *P* | 95%PI | $I^2$ | 95%CI |
|---|---|---|---|---|---|---|
| Main analysis | 0.28 | 0.10—0.47 | < 0.0001 | − 0.44—1.01 | 0.92 | 0.88–0.94 |
| Influential Cases Removed[a] | 0.17 | 0.07—0.28 | < 0.0001 | − 0.20—0.55 | 0.78 | 0.65–0.87 |
| Influential Cases Removed[b] | 0.11 | 0.03–0.19 | 0.1961 | − 0.07–0.29 | 0.27 | 0.0–0.65 |

[a] Removed as outliers: Cheng, & Garisch

[b] Removed as outliers: Calvete, Cheng, Garisch, Goncalves, He, Watson, & Zhang

**Table 4** Distinct resilience factors

| Paper | | | Mean (SD) | | |
|---|---|---|---|---|---|
| Author (YR) | Resilience factor | Definition/operationalization | NSSI ($n = 16$) | | No NSSI ($n = 23$) |
| Covello (2013) [19] | Emotional Reactivity | Ability to control emotions | 1.80 (.93) | | 2.62 (.32) |
| | Mastery | Self-perceptions of their skills and competence level | 2.5 (.57) | | 2.81 (.36) |
| | Relatedness | Perceived quality of relationships with others around | 2.74 (.77) | | 2.81 (.36) |
| | | | Current NSSI ($n = 27$) | Past NSSI ($n = 63$) | No NSSI ($n = 295$) |
| Gonçalves (2023) [33] | Autonomy | Self-perceived ability to solve things on his own | 133.69 | 191.29 | 198.79 |
| | Optimism | More positive perception of life, without excess of preoccupations | 137.70 | 175.79 | 201.74 |
| | Personal Competence | Belief that the subject has on himself as positive perception | 81.59 | 154.14 | 211.49 |
| | Solving Problems | Ability of solving problems, focusing on the way the subject will face the situations | 142.02 | 192.11 | 197.86 |
| | Self-Discipline | Self-perceived capacity of organization on solving tasks | 110.89 | 166.72 | 206.13 |
| | | | NSSI ($n = 67$) | Total ($n = 285$) | |
| Madden (2008) [59] | Locus Of Control | Perceptions of control in academic outcomes. High score = external locus of controle | 11.01 (4.04) | 10.48 (4.33) | |
| | Optimism | High score = higher degree of optimism | 13.91 (3.70) | 14.32 (3.73) | |
| | Self-Efficacy | Perceptions of abilities to perform several academic tasks | 7.83 (1.55) | 7.77 (1.54) | |
| | | | NSSI ($n = 165$) | NSSI + Suicidal behavior ($n = 158$) | |
| Nagra (2016) [69] | Emotion Coping | Self-perceived ability to cope with negative emotions | 10.21 (3.96) | 8.66 *(3.82) | |
| | Problem Solving | Self-perceived ability to problem solve | 12.93 (3.48) | 11.66 * (3.65) | |
| | Social support Seeking | Self-perceived ability to gain social support | 13.35 (3.90) | 12.65 (4.92) | |

Consequently, outlier and influence analyses were conducted to identify potential explanations for this between-study heterogeneity. No multicollinearity was found. Removing influential cases substantially lowered the heterogeneity. Subgroup analyses were performed regarding sample age, resilience type, study quality, sample type and country. Only sample age was a significant predictor of the effect size ($p = 0.0067$). Figure 3 provides a forest plot stratified by sample age, revealing greater effect sizes for the child/adolescent age group (0.35; 95% CI: − 0.01–0.71) and the adult age group (0.38; 95% CI: 0.05–0.71) than for studies with other age group samples. Furthermore, the type of resilience was not a significant predictor of the effect size ($p = 0.067$). Appendix D provides forest plots for resilience type, study quality, sample type and country. However, because of the small subgroups, it is not appropriate to draw conclusions from them, according to Harrer et al. [37], subgroup analyses are only meaningful if at least 10 studies per subgroup are available. If there is publication bias, funnel plots should display roughly symmetrical upside-down shapes. The funnel plots shown in Appendix E do not indicate publication bias. Overall, the trim-and-fill method indicates that the pooled effect of $d = 0.28$ is overestimated due to small-study effects. The prediction interval (0.1—0.47) indicates that small intervention effects cannot be ruled out for future studies.

In addition, several studies have conducted pathway analyses, reporting the moderator and mediator functions of resilience, whereby higher resilience reduces the odds of developing NSSI in the case of stressful or traumatic events. Higher levels of resilience may mitigate the effects of child abuse, other than child sexual abuse, on the prevalence, frequency, and severity of NSSI [41]. In the context of depression, resilience serves to moderate the mediating effect of depression

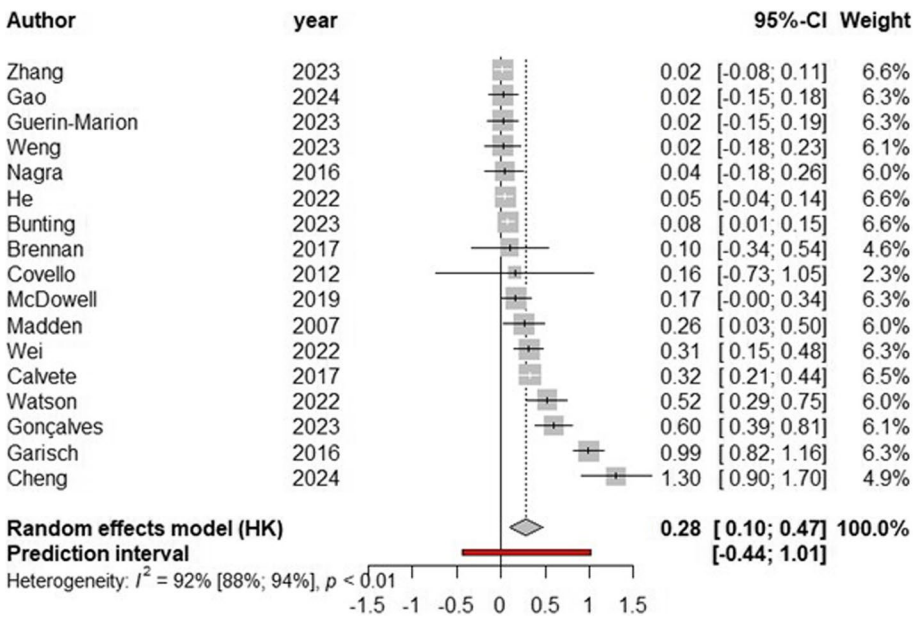


**Fig. 2** Forest plot main analysis

between NSSI and distress rumination [69, 109], stressful events [109] and childhood trauma [110]. Greater resilience may also result in less suicidality in individuals who engage in NSSI [69].

A minority of the papers (4/17) presented effect sizes per resilience factor. Among these resilience factors, problem solving/coping and emotional reactivity were predominantly questioned and presented (Tables 3 and 4). Since not all data were available to calculate a shared effect size, Tables 3 and 4 presents the available mean and, if available, standard deviations per factor. The expected pattern emerged: more difficulty in the intrapersonal domain, emotion coping, and more difficulty in the interpersonal domain.

The groups also varied in size and comparison group. For example, the Nagra [69] study population consisted entirely of people who self-injured. One group suffered from suicidality, and the other did not. The study revealed that the group suffering from suicidality scored lower on intrapersonal and interpersonal factors. Additionally, the Gonçalves study [33] distinguishes three groups: no NSSI, past NSSI, and current NSSI. This shows a gradual progression. The current NSSI group has the lowest or most problematic scores. The past NSSI group had higher scores than did the current group but lower scores than did the group of participants who never self-injured.

## Discussion

The aim of this study was to systematically review and synthesize what is known in the literature on the relationship between resilience and NSSI. The results indicate a significant, albeit modest, inverse relationship between resilience and NSSI, suggesting that individuals with greater resilience are less likely to engage in NSSI. This relationship also appears to have a moderating or mediating character. Higher resilience levels reduce the odds of developing NSSI when confronted with adverse events such as child abuse or when struggling with depression or suicidality.

Resilience has been linked to NSSI. Several studies argue that fostering resilience facilitates long-term recovery from and cessation of NSSI [51, 68]. Interestingly, people with lived experience explicitly mention the importance of resilience [46, 54]. Given these developments, calls have also been made to further investigate the role of resilience in the context of [58]. The current study quantifies this inverse relationship between resilience and NSSI.

First-hand experience shows that a combination of factors is necessary to promote resilience and overcome NSSI [53]. These experiences, combined with the knowledge that changes in emotion regulation capacities and cognitions appear to be unsustainable unless other social and physical systems are addressed in addition to

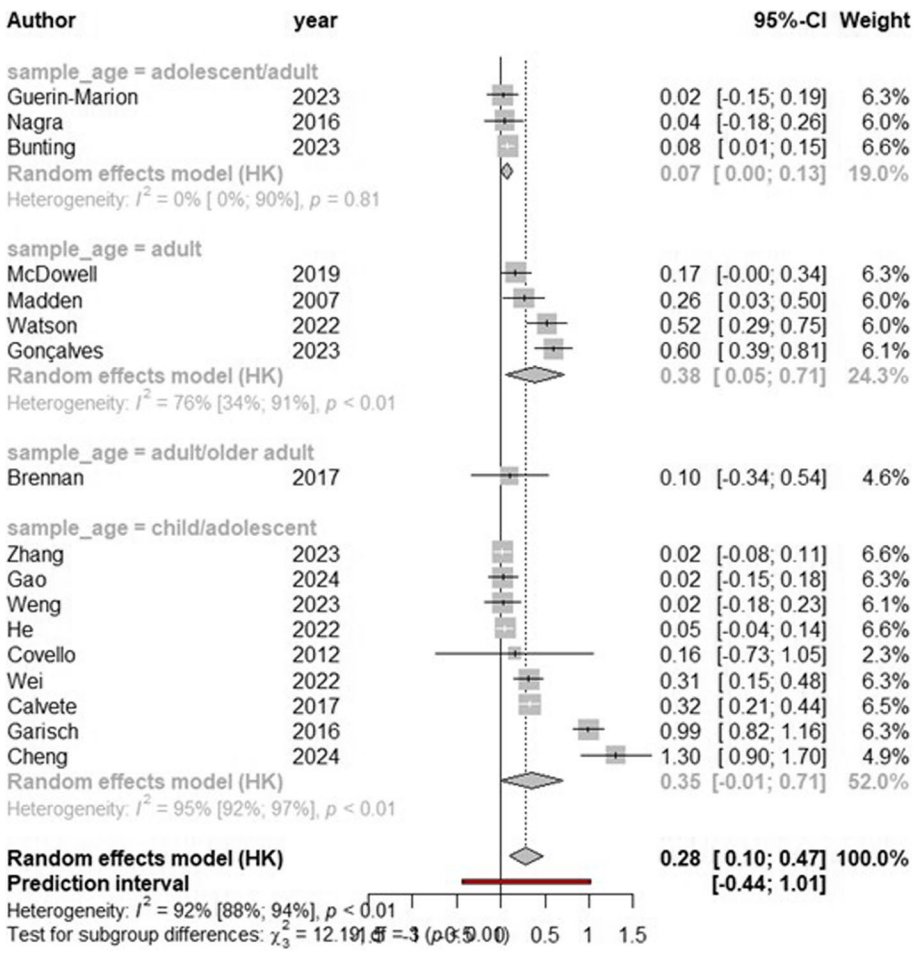


**Fig. 3** Forest plot stratified by sample age

interpersonal systems [85, 98, 99, 101], call for a more holistic approach to the treatment of NSSI. This holistic approach is also reflected in the evolution of the concept of resilience, which has shifted from an individual problem/deficiency to a dynamic, cultural, interactive process [61].

However, this holistic picture does not emerge from the present study. The included studies mostly described resilience from personal and psychological perspectives, with resilience being impaired and lower in people who self-injured. One possible explanation for this is that the most commonly used, researched, and referenced instruments were developed at a time when resilience was generally viewed as a personal and psychological concept. To do justice to the layered, multifaceted nature, and embedded within a social-ecological context, to measure resilience a personalized, tailormade instrument considering a person's health, environment, and society is needed to understand the recovery process [101, 115]. Also, given the nonlinear character, resilience should be measured multiple times [115]. For existing resilience measures this would mean to expand their covering themes with self-efficacy, social support, meaningful life, belonging and emotional skills.

These measurements would ideally be incorporated in the clinical practice. Subsequently, these themes, being frequently mentioned among clinicians as well as people with lived experience to be important for NSSI recovery, could also be included in personalized treatment [46, 52]. To address these themes it could be helpful to include also non-verbal, creative expressions [117]. Also, as mentioned before, recovery and resilience are nonlinear processes, which may result in times where a person does not want to stop NSSI and is resistant to treatment [115]. This requires navigation and negotiation for a personalized treatment [95], addressing person-specific concerns conversationally.

Since the purpose of this study was also to provide an overview of what is understood by resilience in relation to NSSI and how strong this connection is, naming,

defining and operationalizing resilience was an explicit inclusion criterion. Consequently, if, for instance, personal agency and social support were described as concepts distinct from resilience and therefore no resilience factors, they were excluded.

If distinct resilience factors were measured and described in the paper, the next step was to extract the scores for these resiliency factors. It was expected that people who self-injured would score lower on agency and social support and higher on emotion regulation. Indeed, the expected pattern emerged: more difficulty in the intrapersonal domain, more specifically emotion oriented coping, and more difficulty in the interpersonal domain. However, this picture emerged from a very small number of studies (k = 4) and from very diverse groups, both in terms of size and in terms of target populations. If future studies could publish data on their unique resilience factors, this might be helpful in the distillation of recovery-promoting resilience factors.

All included studies provided an ethics statement. These statements are included in Table 1, making explicitly how ethics are guaranteed of studies about potential vulnerable people or people who have difficulty in trusting other people. This is explicitly important not only for professionals, but even more for people with lived experience.

#### Limitations

Evidently this study is not without limitations. First, as the analysis proceeded, it became clear that a complete meta-analysis would not be appropriate. However, a common effect size was calculated as an indication for further research. It would help to specify the quantification direction of a relationship that is difficult to capture in a single effect size. Second, the search for relevant literature was limited to published data and articles published in English and Dutch, which may have led to the exclusion of other pertinent research. Third, it is possible that the criterion of resilience as being obligatory has led to the omission of valuable research. Studies that did not mention resilience explicitly as an indicator did not emerge in the current study. However, this study was intended to focus on whether there is also a definitional quandary regarding resilience in the context of NSSI, which was the case. Fourth, the inquiry of the presence of NSSI varied considerably, ranging from single questions to multi-item lists specifying the methods of self-injury. Single-question definitions have been demonstrated to underestimate the prevalence of self-injury [88], rendering them incompatible with validated measures of self-injury such as the DSHI [34]. Although overall, the methodological quality was medium to high, studies varied in terms of aspects of their methodological quality, including sampling procedures, and settings. Confounding factors were generally not described as accounted for, in future studies propensity score matching could be considered [4]. Fifth, the availability of gender- and age-specific data was limited, which means that these results require further research. The study samples exhibited some diversity in terms of the included age range, which is significant given that the prevalence of self-injury increases throughout childhood and adolescence [40]. This diversity in age-range as well as target populations contribute to a greater heterogeneity, but this diversity is also a reflection of the diversity of the target population.

#### Implications

To provide adequate mental health care for people who self-injure and their loved ones, a clear picture of the factors involved is needed. Such a picture contributes to a holistic approach to healthcare, which is needed to help individuals cultivate personal strength and meaning during the recovery process [79]. This holistic approach includes a support system that quickly identifies biopsychosocial and cultural factors and better supports people who self-injure. This seems even more relevant since changes in emotion regulation skills and cognitions are unlikely to be sustained unless other physical, interpersonal and social factors are considered [85, 97, 101, 102].

The need from clinical practice for tools to strengthen resilience in the case of NSSI is understandable, but given the individual process, it is merely a process of navigation and negotiation [101] about which factors to target and when to do so. However, there are some important factors that emerge from the findings of people with lived experience who have recovered from NSSI, such as emotion regulation, self-efficacy, identifying strengths, help-seeking skills, providing social support, sense of belonging, meaningful life [17, 21, 22, 38, 47, 53, 93]. To gain insight into which resilience factors are most protective against NSSI or act as mediators in recovery, it is recommended that future research publish data on their unique resilience factors. This could be helpful in distilling recovery-promoting resilience factors.

Recovery from NSSI is a nonlinear, multifaceted process. Fostering resilience facilitates long-term cessation and recovery. To achieve this, one must understand resilience in the context of NSSI and have the tools to facilitate personal definitions and treatment for those who self-injure and their environment [115]. In other words, instruments to assess resilience in a multidimensional way are needed. It follows that for a person to achieve recovery and to increase resilience, practitioners should not focus merely on symptoms and the cessation of NSSI. Instead, it is necessary for them to consider how symptoms interact with the various areas of life of the person

who self-injures [6, 53], recognizing that these interactions can vary and may not always follow a predictable pattern. To obtain a clear holistic picture of the factors involved and how these factors interact, personalized, conversation-based approaches to treatment are recommended [6]. Additionally, as NSSI is considered a nonverbal way of expressing what someone is struggling with [78, 117], it is recommended tofacilitate opportunities for creative, non-verbal expressions of distress and strength to come to understand symptoms and their interactions.

Additionally, more research is needed to understand the role of resilience in the nonlinear recovery process. To do justice to the biopsychosocial model, taking into account cultural differences and personal adaptations, follow-up research should draw on a variety of sources and knowledge including both theoretical knowledge from different disciplines [102] and practical and experiential knowledge. This research should explicitly include the voices of people with lived experience in the quest to develop tools and guides to support people who self-injure to express their needs and struggles, as well as to discover their own strengths and the strengths and sources of help around them.

## Conclusion

This review is the first to systematically explore, describe and quantify the rel

ationship between resilience and NSSI. NSSI and resilience are negatively related, and people exhibiting greater resilience are less prone to self-injurious behavior. Following developments in both resilience and NSSI research, this review suggests shifting the focus to a holistic approach that includes both personal, environmental and societal factors. This perspective would do more justice to the multimodal and nonlineair character of the recovery process.

To achieve a holistic understanding of symptoms and their interactions, the development of tools to support professionals in personalized, conversation-based approaches, including nonverbal expressions, to treatment is recommended.

To do justice to this holistic biopsychosocial model, taking into account cultural and personal differences, follow-up research should draw on a variety of sources and knowledge. This research should explicitly include the voices of people with lived experience.

### Abbreviations

| | |
|---|---|
| ASES | Academic Self-Efficacy Scale |
| BCE | Benevolent Childhood Experiences Scale |
| BRS | Brief Resilience Scale |
| CD-RISC | Connor-Davidson Resilience Scale |
| CD-RISC- 10f | 10-Item Connor-Davidson Resilience Scale |
| C-FASM | Chinese version of the Functional Assessment of Self-Mutilation |
| DSHBQ | Deliberate Self-harm Behaviors Questionnaire |
| DSHI | Deliberate self-harm inventory |
| DSHI-s | Deliberate Self-Harm Inventory – Short form |
| FASM | Functional Assessment of Self-Mutilation |
| GMSR | Gender Minority Stress and Resilience measure |
| ISAS | Inventory of Statements about Self-Injury |
| ISSS | International Society for the Study of Self-injury |
| LOT-R | Life Orientation Test-Revised |
| MAAS-A | Mindful Attention Awareness Scale-Adolescents |
| NHS | National Health Service |
| NSSI | Nonsuicidal self-injury |
| Osi | Ottawa self-injury inventory |
| Osic | Ottawa self-injury inventory Chinese revised edition PEO: population, exposure, outcome |
| PRESS | Peer Review of Electronic Search Strategies |
| PRISMA | Reporting Items for Meta-analysis and Meta-Analysis |
| RAS | Resilience Appraisal Scale |
| RS | Resilience Scale for College Students |
| RS | Resilience Scale |
| RSA | Resilience Scale for Adults |
| RSCA | Resilience Scale for Children and Adolescents |
| SIQ-TR-SF | Self-Injury Questionnaire - Treatment Related – Short Form |
| TALCS | Trice Academic Locus of Control Scale |

## Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12888-025-06868-3.

Supplementary Material 1.

Supplementary Material 2.

Supplementary Material 3.

Supplementary Material 4.

Supplementary Material 5.

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### Authors' contributions

DW, NK-G, CB and RRJM contributed to the conceptualization of this paper. DW and CB designed the methodology of the study, DW performed the data collection and data curation. NK-G, DM and CB contributed to the validation of this paper. DW wrote and prepared the original draft, and all five authors (DW, NK-G, DM, RRJM and CB) contributed to the reviewing and editing process. This paper was written under supervision of CB and RRJM. All authors read and approved the final manuscript.

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### Data availability

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

## Declarations

### Ethics approval and consent to participate

Not applicable.

### Consent for publication

Not applicable.

**Competing interests**
The authors declare no competing interests.

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