



# Risk and protective factors for self-harm in adolescents and young adults: An umbrella review of systematic reviews

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## ABSTRACT

We conducted an umbrella review to synthesise the evidence from systematic reviews and meta-analyses that examined the risk and protective factors for self-harm in young people. We searched six different databases and used the AMSTAR-2 checklist for quality assessment. The importance of each risk and protective factor was determined based on (1) the number of times it was identified by general reviews examining any risk or protective factor, and (2) the effect sizes from meta-analyses. There were 61 systematic reviews included in this review. The most frequently identified risk factors for self-harm in young people included childhood abuse, depression/anxiety, bullying, trauma, psychiatric illnesses, substance use/abuse, parental divorce, poor family relationships, lack of friends, and exposure to self-harm behaviour in others. The risk factors with the strongest evidence for an association with self-harm were behavioural disorders, personality disorders and depression or anxiety. There was a dearth of systematic reviews examining protective factors but good family/friend relationships were most frequently identified. There was also evidence to show that non-suicidal and suicidal self-harm shared many of the same risk factors. Clinicians and other professionals who work with young people should be particularly cognisant of the psychiatric and adverse life event risk factors as well as the substance use, education-related and individual-level (e.g. being LGB) risk factors for self-harm. Knowledge of risk factors for self-harm can potentially be used to inform the design and implementation of prevention measures and further research is needed on the protective factors for self-harm.

## 1. Introduction

Suicide and self-harm in young people are major public health concerns. While suicide rates declined globally during the last three decades, suicide still ranks in the top ten leading causes of age standardised years of life lost in many parts of the world, and, is the fourth leading cause of death in 15–29 year olds globally (Naghavi, 2019; World Health Organization, 2021). For each death by suicide, there are many more people who either attempt suicide or engage in an act of self-harm (World Health Organization, 2021). According to the WHO (World Health Organization), a prior suicide attempt is the single most

important risk factor for suicide (World Health Organization, 2021). The risk of suicide for patients who present to hospital following an act of self-harm (both non-suicidal and suicidal) is approximately 50 times greater than in the general population (Hawton et al., 2015; Lin et al., 2019).

Adolescents are a group who are particularly susceptible to self-harm with approximately 30,000 adolescents in the UK receiving hospital treatment for self-harm each year (Hughes et al., 2018). Furthermore, the risk of a death by suicide increases with the number of self-harm episodes and the risk is higher in those aged 10–24 years as compared to older age groups (Aggarwal et al., 2017; Zahl and Hawton, 2004). This age range can be referred to as the adolescent and young adult

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**Abbreviations**

ACEs	adverse childhood experiences
ALEs	adverse life experiences
AYA	adolescent and young adult
DSH	deliberate self-harm
LGB	lesbian, gay or bisexual
LGBQ	lesbian, gay, bisexual or questioning
LMIC	low- and middle-income country
NSSI	non-suicidal self-injury
OR	odds ratio
pOR	pooled odds ratio
PTSD	post-traumatic stress disorder

RCSI	Royal College of Surgeons Ireland
ROB	risk of bias
SA	suicide attempt
SD	suicide death (or death by suicide)
SI	suicidal ideation
SIB	self-injurious behaviour
SITB	self-injurious thoughts and behaviours
SP	suicide plans
SSHB	suicidal and self-harming behaviour
STB	suicidal thoughts and behaviours
UK	United Kingdom
WHO	World Health Organization

(AYA) group (Sawyer et al., 2018). Non-suicidal self-injury (NSSI) is common among AYAs: a study by Muehlenkamp et al. found that approximately 16–18% of teenagers reported to have engaged in NSSI at least once in their lifetime (DeAngelis, 2015; Muehlenkamp et al., 2012). AYAs engaging in NSSI behaviour may later transition into exhibiting suicidal self-injury (SSI) behaviour (Grandclercq et al., 2016; Hawton et al., 2012) and there is evidence that deliberate self-harm is associated with death by suicide among young people (Fortune et al., 2007; Hawton et al., 2012).

There are many systematic reviews that have been completed on the risk and protective factors for self-harm behaviour in AYAs (McEvoy et al., 2022). Some of these were general in their nature – examining a myriad of risk/protective factors for self-harm in AYAs (Abdelraheem et al., 2019; Aggarwal et al., 2017; Bozzini et al., 2021; Carballo et al., 2020). Other systematic reviews examined a specific risk or protective factor (Bottino et al., 2015; Chiu et al., 2018; Kearns et al., 2020). There is a need for an umbrella review to synthesise and collate the evidence from these studies (McEvoy et al., 2022). This umbrella review establishes the most important risk and protective factors for self-harm in AYAs that have been identified by systematic reviews. Moreover, this study identifies the gaps in the literature for further research.

## 2. Methods

The review protocol was registered with PROSPERO (Prospero registration number: CRD42021282277) and the review protocol was also published on HRB Open Research (McEvoy et al., 2022; National Institute for Health Research, 2023). We followed the Preferred Reporting Items for Systematic Reviews and Meta-analyses (the PRISMA statement) checklist for conducting this study (Moher et al., 2009).

### 2.1. Definitions

Definitions of self-harm vary through the literature mainly due to the fact that an act of deliberate self-harm (DSH) can be non-suicidal (NSSI) or suicidal (SSI). While the Diagnostic and Statistical Manual of Mental Disorders (Fifth Edition) differentiates between suicidal and non-suicidal self-harm (American Psychiatric Association, 2013), there is a substantial overlap between the two, with some deeming this categorisation arbitrary (Aggarwal et al., 2017). It has been found that a majority (over 70%) of adolescents who engage in NSSI report to have had a lifetime suicide attempt (Nock et al., 2006). Indeed, the International Classification of Diseases (11th Edition) (ICD-11) does not differentiate between suicidal and non-suicidal self-harm (World Health Organization, 2022). Hence, the outcome for this study is ‘self-harm’ and is defined as “an act with a non-fatal outcome in which an individual deliberately initiates a non-habitual behaviour, that without

intervention from others will cause self-harm, or deliberately ingests a substance in excess of the prescribed or generally recognised therapeutic dosage, and which is aimed at realising changes that the person desires via the actual or expected physical consequences” (Platt et al., 1992). Hence, we excluded suicidal ideation (SI), threats, plans (SP) or risks and suicide death (SD) from the outcome – there had to involve an initiation of an act with a non-fatal outcome. We examined the umbrella term of ‘self-harm’, which can be suicidal or non-suicidal in its nature. We also examined the sub-outcomes of NSSI and SSI when it was possible to identify these outcomes.

There have also been various definitions for adolescence in different studies. Previously, studies have defined adolescence as the period of life between the start of puberty and the point at which an individual attains a stable, independent role in society; however, the timing of puberty and the transition to adulthood varies across time and cultures (Pozuelo et al., 2021). The population of interest for this review was adolescents and young adults (AYAs), which roughly encompasses people aged 10–24 (Sawyer et al., 2018).

### 2.2. Search strategy

The search strategy for this umbrella review followed the PECO (population, exposure, comparison, and outcome) format. The population was AYAs. The exposures were the various risk and protective factors for self-harm and the comparisons were the absences of the same risk and protective factors. The outcome was self-harm.

Six databases were used for this umbrella review: Ovid Medline, Embase, APA PsycInfo, the Cochrane Database of Systematic Reviews, CINAHL, and Scopus. See [Supplementary Material 1](#) for full details. The search strategy used the key words involving risk/protective factors, self-harm and suicidal, AYAs and systematic reviews. Using this search strategy, we found that a substantially high proportion of systematic reviews ever published were within the period from 2010 to 2021. Moreover, it is likely that these systematic reviews could themselves be considered to have summarised and included significant findings and studies prior to 2010. Hence, the search strategy used the six mentioned databases and included studies published from 2010 up until October 12, 2021 to ensure that the evidence was contemporary and up-to-date.

### 2.3. Primary screening (eligibility criteria)

Systematic reviews and meta-analyses that were peer reviewed and published were included as far back as the year 2010 and up to October 2021. At this stage of the screening, systematic reviews dealing with risk and/or protective factors for self-harm and suicidal ideation and/or behaviour in AYAs were included from a myriad of geographical and sociodemographic locations. In addition, studies that examined the AYA

age group or general age groups that included the AYA group as a subset were included for full paper screening. Similarly, studies that examined self-harm and suicidal ideation and/or behaviour or studies that examined general health or general mental health were included for the next screening phase. Each systematic review had to mainly examine AYAs from community-based samples. Details of the exclusion criteria at this stage of screening are detailed in [Supplementary Material 2](#).

The results from the search strategy of the six aforementioned databases were compiled into the Rayyan software by the first author ([Ouzzani et al., 2016](#)). Two authors, the first author and LC, independently screened the title and abstracts of the results for inclusion. Selection and exclusion of articles was determined using the inclusion/exclusion criteria. All conflicts were discussed between DME and LC to be included or excluded by consensus. When there was still no agreement as to whether a study ought to be included or not, it was then forwarded to MC to make a final judgement.

#### 2.4. Secondary screening (study selection)

The included studies from the primary (title and abstract) screening then went through a full-paper secondary screening phase (by DMcE in consultation with the other authors). Then a random sample (10%) was checked by another author (EB). During this screening phase, systematic reviews and meta-analyses that examined self-harm and suicidal ideation and/or behaviour in all ages were only included if the AYA group could be identified as a sub-population in that study. Similarly, systematic reviews and meta-analyses that examined general health or general mental health outcomes were only included if self-harm and suicidal ideation and/or behaviour was examined and identifiable as a sub-outcome. Furthermore, any umbrella review (or review) of systematic reviews were checked to identify any additional (systematic review or meta-analysis) references; these were then each screened using the same screening process as described thus far. These (umbrella) reviews were then excluded.

#### 2.5. Tertiary screening (including studies for the refined outcome of self-harm)

Many of the included studies after full paper screening included outcomes such as ‘suicidality’ or ‘suicidal behaviours’. Some of these included suicidal ideation, plans, threats or risks or suicide death in the outcome, whereas others used these terms to mean suicide attempts (SA) only. During this tertiary screening phase (by DMcE in consultation with the other authors), each paper was checked so that only papers with the outcome of ‘self-harm’ (NSSI or SSI/suicide attempt) were included. Studies that included suicidal ideation, plans, threats or risks or suicide death as part of an outcome like ‘suicidality’, ‘suicidal behaviours’ or ‘self-injurious thoughts and behaviours’ were excluded. Suicidal ideation, plans, threats or risks does not necessarily imply an initiation of any behaviour required for the definition of self-harm as an act, as per the definition used in this study ([Platt et al., 1992](#)). In addition, suicide death does not fully overlap with self-harm, especially since self-harm is defined as a ‘non-fatal’ act as per the same definition ([Platt et al., 1992](#)). However, if it was possible, in the systematic review, to disentangle ‘suicide attempt’ as a sub-outcome from the other suicide-related outcomes, then it was included for data extraction and analysis. Furthermore, any details from excluded studies from this screening phase were detailed in the supplementary material and details of outcomes relating to suicidal ideation, plans, threats or risks or suicide death from included studies were also detailed in the same supplementary material. We deemed that while these outcomes were different to non-fatal self-harm, they were also inherently related, thus warranted reporting while not being included in the analysis.

#### 2.6. Data extraction

The data extracted for each included study after the secondary and tertiary (full-paper) screening included: author and year of publication; number of studies included; the total number of participants in all the included studies in the systematic review and/or meta-analysis (if reported); the number and list of databases used for the review; the outcome defined for the review; the age cohort; and, the main findings regarding the risk and protective factors for self-harm in AYAs. In the case that the review had a general age cohort, then the sub-age cohort for AYAs was also reported. Similarly, if the review had a general health outcome or general mental health outcome, then the specific sub-outcome(s) relevant to self-harm were reported. In the case that the outcomes for the systematic review included relevant sub-outcomes (like NSSI and suicide attempts) and irrelevant suicidal outcomes (like suicidal ideation, plans, threats or risks or suicide death), then only the relevant outcomes were included for analysis. The irrelevant suicidal outcomes were included in the supplementary material, as outlined before. In the case that a meta-analysis was included in the review, then the various effect sizes (usually pooled odds ratios) were also extracted, along with its 95% confidence interval and the  $I^2$  value measuring heterogeneity, if reported. After data extraction, a random sample (10%) was checked by another author (EB).

#### 2.7. Quality assessment

A quality assessment was conducted for each of the systematic reviews included in this umbrella review. Again, a random sample (10%) was checked by EB. The AMSTAR-2 checklist, a critical appraisal tool for systematic reviews, was used for this quality assessment process ([Shea et al., 2017](#)). This is a 16-item check question list for which the reviewers assign “yes”, “no”, or “partial yes” to each of the questions ([Shea et al., 2017](#)). The details of the 16-item list and how we utilised it for this review can be seen in [Supplementary Material 3](#). Based on these criteria, we determined a quality rating of high, medium, or low for each of the included systematic reviews.

#### 2.8. Synthesis and reporting

There were broadly two types of reviews compiled in this umbrella review, and these two types of reviews were further divided into two sub-categories. Firstly, “general systematic reviews” examined a myriad of risk/protective factors for self-harm in AYAs in the community (non-clinical) setting. Secondly, “factor-specific systematic reviews” examined a specific risk or protective factor in relation to the same. Furthermore, each of these two types of systematic reviews were further subdivided into those which had and those which had not completed a meta-analysis or meta-analyses as part of the review.

A descriptive table was created for each of these four subcategories with author and year details; search dates; total number of participants (if reported); number and lists of databases used; outcome and age cohort data. The main findings relating to risk and/or protective factors were reported in all four tables. For factor-specific reviews, the details of the risk/protective factors were also reported. For reviews including meta-analyses, the effect size (usually the pooled odds ratio), the matching 95% confidence interval and the heterogeneity  $I^2$  statistic (if reported in the review or its supplementary material) was also reported.

Having noted the risk factors for each study, we then classified each of these into the following five categories: psychiatric or psychological; individual-level physical or fixed; adverse childhood experiences (ACEs) or adverse life experiences (ALEs); environment or social; and, behavioural. These are not mutually exclusive categories and some of the risk factors could potentially be allocated under two or more categories. For

example, ‘substance use and abuse’ was included in “behavioural” but could also have been included under “psychiatric or psychological”. The protective factors were not organised into overarching categories in the way the risk factors were as there were substantially fewer protective factors identified and very few of the reviews examined protective factors.

2.9. Determining and comparing the most important risk and protective factors

There were broadly two ways in which we determined the most important risk and protective factors for self-harm in AYAs. Firstly, we examined the number of times the risk/protective factor was identified by the general reviews that sought to find any factor that was associated with self-harm in AYAs. Secondly, we examined the size of the effect measures (pooled odds ratios - pORs) from the studies that included meta-analyses. Both of these methods were used to determine which risk and protective factors had the highest amount of evidence for being associated with self-harm in AYAs.

2.10. Comparing the risk factors for NSSI and SSI

In some of the general systematic reviews, it was possible to specify whether the outcome of self-harm was NSSI or SSI, as opposed to a general mention of DSH. This selection of reviews allowed us to compare the risk factors that were identified for the two types of self-harm.

3. Results

There were 2384 studies initially identified. We then removed 479 duplicates leaving 1905 for the primary (title and abstract) screening. During the primary screening phase, 128 further duplicates were removed and 1602 studies were excluded using the inclusion/exclusion criteria. Hence, we had 175 articles for the full paper secondary screening phase. During this secondary screening phase, 90 papers were removed with reasons outlined in Fig. 1 and 85 papers were included for the tertiary screening phase. There was a review of four systematic reviews (Maniglio, 2011) and an umbrella review (Sahle et al., 2021) included in these 90 excluded studies. The references of these studies (Maniglio, 2011; Sahle et al., 2021) were examined and checked against the inclusion criteria. One systematic review (Moore et al., 2017) was added from these references. Then, the outcomes in the 86 included reviews were carefully screened during the tertiary screening phase, resulting in 25 reviews being excluded (with reasons outlined in

Supplementary Material 4). Hence, there were 61 systematic reviews and/or meta-analyses for data extraction, quality assessment and analysis.

These 61 systematic reviews and/or meta-analyses were divided into two categories. Firstly, there were 12 ‘general systematic reviews’, which were subdivided into 10 reviews without any meta-analyses and 2 reviews with meta-analyses. Secondly, there were 49 systematic reviews and/or meta-analyses that were ‘factor specific’ which included 24 that had no meta-analysis and 25 with meta-analyses. The details of the full screening process and the categorisation of the reviews into different categories is outlined in Fig. 1.

3.1. General characteristics of the reviews

Most of the included systematic reviews (and/or meta-analyses) did not specify a location or a particular cohort of people to be examined but there were some exceptions: Quarshie et al. examined young people in Sub-Saharan Africa (Quarshie et al., 2020) and Rojas-Velasquez et al. studied African American and Hispanic AYAs (Rojas-Velasquez et al., 2020). The Pozuelo et al. study examined AYAs in low- and middle-income countries (LMICs), whereas Fry et al. examined the East Asia and Pacific Region (Fry et al., 2012; Pozuelo et al., 2021). Qu et al. examined children who were “left-behind” after a parent migrated (Qu et al., 2021). In this study, it appeared that China was the primary location of the study (Qu et al., 2021). All of the other studies did not deal with a specific race of people nor a specific geographic location.

The most common age range for young people in studies included in this umbrella review was 10–25 years old (Sawyer et al., 2018). Out of the 61 included studies, 28 of these defined the age range to be up to approximately 25 years, or approximately 10–25 years. Next, there were 17 that used terms like “adolescents”, “teenagers”, “young people” or “children” – the latter included people up to 18 years old. There were 9 studies that included persons up to 17, 18 or 19 years or from approximately 10-18 years. One study looked at people going to ‘school’ (Marraccini and Brier, 2017) and three studies that described people as attending school, college, or university (Batejan et al., 2015; Cipriano et al., 2017; Moller et al., 2013). Gobbi et al. was an outlier since it described young adults as people aged 18–32 (Gobbi et al., 2019). Woo et al. included people up to 20 years and van Geel et al. included people aged 9–21 years (van Geel et al., 2014; Woo et al., 2020). Overall, a majority (34/61 or 56%) broadly used the full AYA range.

The majority (69% or 42/61) of the reviews conducted their search strategy from inception; 14 studies used a period of approximately

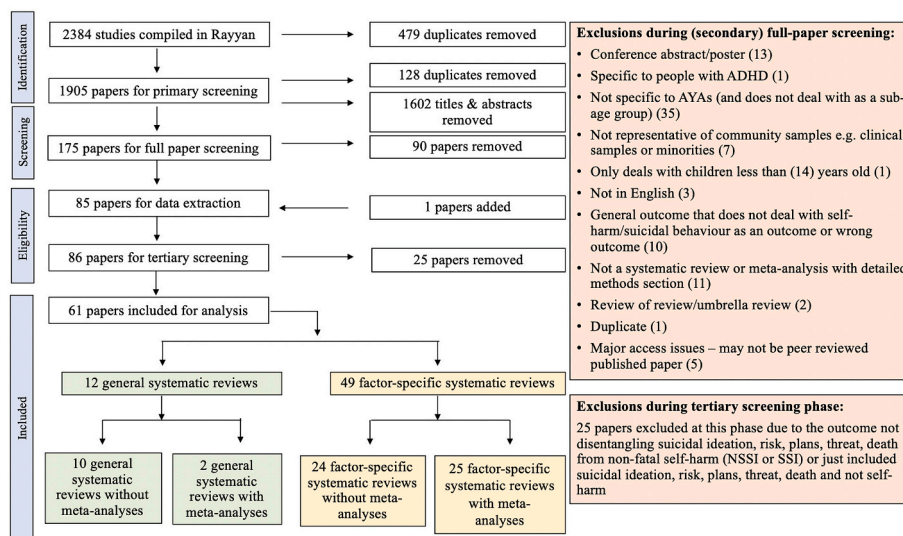


Fig. 1. The screening and categorisation process.

18–40 years; three used approximately 10 years; and, there were also two studies for which the search period was unclear.

### 3.2. Quality assessment

The results from the quality assessment can be seen in [Supplementary Material 5](#). In all, 31 studies were deemed to have high quality, 18 were deemed to have medium quality and 12 were deemed to have low quality. One of the main reasons for a review being deemed to have poor quality was that it did not carry out any risk-of-bias or quality assessment, or account for the quality of the studies in the review. Moreover, in the case of meta-analyses, some studies did not account for publication bias. Out of the 27 studies that did include meta-analyses, only 20 properly assessed publication bias – three partially assessed publication bias and four did not mention publication bias at all. None of the studies reported the sources of funding for the individual primary studies.

### 3.3. Details of the individual studies

The details from the four different types of systematic reviews are included in the following four tables. The characteristics and results of the ‘general systematic reviews’ are described for those without meta-analyses in [Table 1](#) and for those with meta-analyses in [Table 2](#). The characteristics and main results of the ‘factor-specific reviews’ without meta-analyses are outlined in [Table 3](#) and the ‘factor-specific reviews’ with meta-analyses are outlined in [Table 4](#). Note that only the risk factors for which there is evidence of an association with the outcomes have been reported in these tables. Furthermore, evidence for other suicidal outcomes (like suicidal ideation or suicide death) from both included studies and excluded studies from the tertiary screening phase are detailed in [Supplementary Material 4](#).

### 3.4. What are the most important risk factors for self-harm in AYAs that have been identified by systematic reviews in the literature?

A synthesis of the risk and protective factors as identified from the 61 included studies is displayed in [Table 5](#). The second column in [Table 5](#) lists the number of general systematic reviews that found an association between that factor and self-harm in AYAs. In the cases where a meta-analysis was performed for the risk/protective factor, the lowest pOR and highest pOR are also listed in two separate columns (along with their 95% confidence interval and the reference to that study). The risk/protective factors are ranked in order of how many times they appeared in the general reviews in each of the six sections of the table. Moreover, in the case where only one pOR could be identified, it was just listed in the “Highest pOR” column. [Supplementary Material 6](#) has tables outlining the general reviews that identified the risk/protective factors and a full list of pORs.

For the first method for examining the most important risk factors for self-harm, [Fig. 2](#) presents a ranking for the number of times a risk factor has been identified by the 12 general reviews that sought to identify any factor that was associated with self-harm in AYAs. All three outcomes (NSSI, SSI/suicide attempt, or self-harm where the intent was not specified) are contained in the outcome of self-harm in [Fig. 2](#). Only risk factors identified by two or more reviews were included in [Fig. 2](#).

For the second method for examining the most important risk factors, [Fig. 3](#) is a sunburst chart which presents the size of the effect measures (pORs) from the studies that included meta-analyses. The highest pORs were used in this chart and only pORs of at least 2.0 have been included. The risk of each outer sector of the sunburst chart is proportional to the pOR for each risk factor. Moreover, we excluded the enormous pOR for the risk factor of previous self-harm/suicide attempt behaviour (31.33 (9.36–104.8) (Miranda-Mendizábal et al., 2019)) for two reasons: the outcome is the same as the exposure; and, it would otherwise have dominated the chart and not allow us to examine the other risk factors.

The psychiatric/psychological and the ALE were identified more

frequently than the other three categories. In addition, these two categories had the highest pORs. The fixed/physical category risk factors appeared much less frequently than the other four categories, with “being female” as the only fixed/physical risk factor in [Fig. 2](#). Only this risk factor and “being LGB” appeared in [Fig. 3](#).

#### 3.4.1. Psychiatric or psychological risk factors

Psychiatric or psychological risk factors accounted for three out of the top ten most identified risk factors from the general reviews in [Fig. 2](#): namely, depression/anxiety, other psychiatric illnesses (like bipolar disorder for example), and, exposure to NSSI/SSI in others. Moreover, most of the pORs (greater than 2) identified in [Fig. 3](#) were from this category – the largest of these being conduct/behavioural issues with a pOR of 8.78 (2.77–27.84) (Miranda-Mendizábal et al., 2019). Other psychiatric/psychological risk factors with strong evidence for an association with self-harm included emotional distress/disorder; personality disorders; eating disorders; suicide of a family member or friend; a history of psychiatric illness in the family; low self-esteem; impulsiveness; hopelessness or pessimism; ADHD; and, having certain personality traits, like socially prescribed perfectionism, neuroticism, and interpersonal dependency.

#### 3.4.2. ALE risk factors

The most frequent risk factor identified for self-harm by the general reviews was childhood neglect or (sexual) abuse. The other three ALE risk factors for self-harm in the top ten most identified in [Fig. 2](#) were bullying; general mentions of ALE or trauma; and, parents separating or having a divorce. The highest pOR from this category was for bullying: 6.30 (1.53–25.90) (Miranda-Mendizábal et al., 2019). Other prominent ALE risk factors included being a victim of dating/relationship violence, or experiencing a breakup in a relationship.

#### 3.4.3. Behavioural risk factors

Substance use or abuse was the most frequently identified risk factor from this category – identified by six general reviews and with a pOR of 4.44 (2.51–7.83) (Miranda-Mendizábal et al., 2019) for drugs and cannabis and a pOR of 2.69 (1.32–5.50) (Miranda-Mendizábal et al., 2019) for alcohol. The largest pOR from this category, however, was for school truancy or school drop-out: 6.44 (3.03–13.65) (Castellví et al., 2020). Poor academic performance also appeared to be another important risk factor, identified in three general reviews.

#### 3.4.4. Environmental or social risk factors

Having poor family relationships or lack of friends featured prominently on [Fig. 2](#) ranked list. Lower SES, having a harsh or controlling parent and experiencing discrimination or racism also featured on this list. Only one pOR over 2 was identified from this category – namely, being in foster care with a pOR of 3.89 (3.14–4.83) (Evans et al., 2017).

#### 3.4.5. Individual-level physical or fixed risk factors

The risk factors from the individual-level fixed or physical group were identified least often of the five categories in the general reviews. Only one of these risk factors featured on [Fig. 2](#) ranked list: namely, being female was a risk factor that was identified in three general reviews. Miranda-Mendizábal et al. also reported a pOR of nearly two between being female and having a suicide attempt (Miranda-Mendizábal et al., 2019). Batejan et al. reported a pOR of 3.00 (2.46–3.66) between overall weighted effect size between being LGBQ and NSSI – though this study also reported a pOR of 4.37 between being specifically bisexual and NSSI (Batejan et al., 2015).

#### 3.4.6. Comparing the risk factors for NSSI and SSI

In eight of the 12 general systematic reviews (Abdelraheem et al., 2019; Aggarwal et al., 2017; Bozzini et al., 2021; Cipriano et al., 2017; Li et al., 2012; Miranda-Mendizábal et al., 2019; Rojas-Velasquez et al., 2020; Valencia-Agudo et al., 2018), it was possible to specify NSSI or SSI

**Table 1**  
General Systematic Reviews with no meta-analyses.

Systematic Review	Number of primary studies	Search dates	Number of Databases searched: and list	Outcome	Age cohort (specified?)	Main findings for risk/protective factors
<a href="#">Abdelraheem et al. (2019)</a>	25	up to July 2018	4: Scopus, CINAHL, PsycInfo and Medline	NSSI and SA	Less than 25 years old	<ul style="list-style-type: none"> <li>● Predictors for NSSI: childhood abuse/neglect; perceived parental control; cognitive vulnerability interaction; ADHD; depression; anxiety; stress; borderline personality disorder; attachment anxiety; peer victimisation; exposure to NSSI in peers; self-identification with NSSI; socially prescribed perfectionism</li> <li>● Protective factors for NSSI: perceived social support; life satisfaction</li> <li>● Predictors for SAs: childhood sexual/physical abuse; ALEs; anxious traits; disruptive traits; anger traits; ADHD; post hospitalisation change in connectedness (with family and peers); socially prescribed perfectionism; recent life events</li> <li>● Protective factors for SAs: nurturing/involved/warm parenting; active coping style</li> </ul>
<a href="#">Aggarwal et al. (2017)</a>	27	up to August 2015	3: MEDLINE, PsycInfo and Scopus	Self-harm and suicidal behaviour	12–25 years old	<ul style="list-style-type: none"> <li>● Specific to LMICs.</li> <li>● Risk factors for self-harm: low education of father; perceived family economic status poor; self-injury of friend/peer; below average school performance; high truancy; school absenteeism</li> <li>● Protective factors for self-harm: positive youth development; many (&gt;2) friends; higher academic/school competence</li> <li>● Risk factors for suicidal behaviour: not living with parents; unsatisfying/strained/conflictual relationships; parents divorced and remarried to a new parent; physical abuse by parents; poor maternal general health; suicide by friend; lack of close friends; not attending school or college</li> <li>● Protective factors for suicidal behaviour: higher family functioning; positive youth development; understanding parents</li> </ul>
<a href="#">Bozzini et al. (2021)</a>	249 studies	up to August 2018	3: PubMed, PsycInfo, and Lilacs	Risky behaviours (self-injury and suicidal behaviours in 26.1% of studies)	10–19 years old	<ul style="list-style-type: none"> <li>● Risk factors for NSSI: low socioeconomic status at birth;</li> <li>● Risk factors for suicide attempts: emotional disorders in early childhood; adoption</li> <li>● Risk factors for self-injury (motive not clear): involvement in violence; physical health problems; being overweight; conduct issues; bullying; poor school connectedness; poor neighbourhood safety; maternal suicide intent; being a goth;</li> </ul>
<a href="#">Carballo et al. (2020)</a>	44 studies	up to December 2016	1: PubMed	Self-harm including both NSSI and SA	Under 18 years old	<p>Identified three types of risk factors:</p> <ol style="list-style-type: none"> <li>(1) Psychological factors: depression, anxiety, previous suicide attempt, drug and alcohol misuse, low instrumental and social competence (like being in a fight), and other comorbid psychiatric disorders.</li> <li>(2) Stressful life events: family problems, academic stressors, trauma, worries about sexual orientation, romantic breakups, exposure to suicide/suicide attempts, being bullied and peer conflicts.</li> <li>(3) Personality traits: neuroticism, perfectionism, interpersonal dependency, novelty-seeking, pessimism, low self-esteem, a perception that one is worse off than one's peers, self-</li> </ol>

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Table 1 (continued)

Systematic Review	Number of primary studies	Search dates	Number of Databases searched: and list	Outcome	Age cohort (specified?)	Main findings for risk/protective factors
Cipriano et al. (2017)	53 studies	1998–2016	2: PubMed and PsycARTICLES	NSSI	General age group but adolescents and college students examined as a sub-group	criticism, maladaptive coping styles and impulsivity. <ul style="list-style-type: none"> <li>● Childhood maltreatment emerged as a predictor of NSSI in adolescents and college students.</li> <li>● Some studies showed a strong association between childhood sexual abuse and NSSI but other studies did not find a strong correlation.</li> <li>● Paternal emotional neglect were significant predictors of NSSI within women, whereas NSSI in men was primarily predicted by childhood separation (usually from father).</li> <li>● ALEs were found to be a risk factor while good emotional regulation was found to be a protective factor.</li> </ul>
Grandclerc et al. (2016)	64 studies	January 1990–January 2014	2: Medline and PsycInfo	NSSI and suicidal behaviour	People aged 11–25 years old	<ul style="list-style-type: none"> <li>● Narrative systematic review to examine the relationship between NSSI and suicidal behaviour.</li> <li>● NSSI and suicidal behaviour have some shared risk factors: depression, borderline personality disorder, substance abuse, posttraumatic stress disorder, impulsivity, externalizing behaviours, attention deficits, with or without hyperactivity, and conduct disorders, a history of sexual abuse or physical violence, and family dysfunction.</li> </ul>
Quarshie et al. (2020)	74 studies	1950–August 2019	5: MEDLINE, PsycInfo, PubMed, African Journals OnLine, and African Index Medicus	Self-harm (both suicidal and non-suicidal)	Adolescents (aged 10–25 years) in sub-Saharan Africa	<ul style="list-style-type: none"> <li>● 48/74 studies reported on risk factors and no study reported protective factors against self-harm.</li> <li>● Risk factors at the personal level included: depression, hopelessness and psychiatric illness.</li> <li>● Risk factors at the family level included: conflict with parents, parental divorce.</li> <li>● Risk factors at the school level included: academic failure.</li> <li>● Risk factors at the interpersonal level included: relationship breakups and problems, and lack of social support.</li> <li>● Abuse and violence-related risk factors included sexual abuse, dating violence, bullying, and physical fights.</li> </ul>
Rahman et al. (2021)	27 studies (N = 31,675 at follow-up)	2010–April 2020	4: Medline, PubMed, PsycInfo and CINAHL Plus	Repeated self-harm (regardless of intent- onset of self-harm excluded)	Adolescents aged 10–19 years (but can include anyone up to 25 years)	<ul style="list-style-type: none"> <li>● Divided risk factors into three types: psychological, psychosocial and sociodemographic:</li> </ul> <ol style="list-style-type: none"> <li>(1) Psychological risk factors included psychiatric morbidity, features of previous self-harm, psychological distress, and prior psychiatric treatment, motives and other psychological factors (e.g. poor sleep).</li> <li>(2) Psychosocial risk factors included family-related factors, insecure peer relationships, alcohol misuse, and other psychosocial factors (e.g. ACEs). <ul style="list-style-type: none"> <li>● Family-related factors include childhood sexual abuse, high parental expectations, insecure maternal attachment.</li> </ul> </li> <li>(3) Sociodemographic factors included age (increased), gender (being female) and ethnicity (varying results for this).</li> </ol>
Rojas-Velasquez et al. (2020)	15 studies	2000–2018	3: PubMed, PsycInfo, and Google Scholar	NSSI	African-American or Hispanic AYAs with a mean age 13–25 years	<ul style="list-style-type: none"> <li>● Risk factors identified here are specific to African-American and/or Hispanic youth.</li> <li>● Some of the risk factors identified are: acculturation-gap or immigration stress; emotional distress; bullying; parental divorce; family loss due to migration; involvement with juvenile justice system;</li> </ul>

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Table 1 (continued)

Systematic Review	Number of primary studies	Search dates	Number of Databases searched: and list	Outcome	Age cohort (specified?)	Main findings for risk/protective factors
Valencia-Agudo et al. (2018)	39 studies	up to January 2017	4: Medline, PsycInfo, Embase and Web of Science	NSSI	Adolescents aged 10–19 years old	<p>child maltreatment; racism; mental distress.</p> <ul style="list-style-type: none"> <li>● Protective factors included a sense of belonging/social support; regular church attendance.</li> <li>● Five samples found that being female was a significant predictor for NSSI; two studies found that being male was predictive of NSSI; four found no significant effect of gender.</li> <li>● One sample found not being religious was a predictor and another study found no association.</li> <li>● One sample found physical abuse was a predictor and another study found no association.</li> <li>● Two samples found a significant association between sexual abuse and NSSI (7–8 times the odds).</li> <li>● For peer victimisation, 5/7 samples found a significant association.</li> <li>● Eight samples found significant associations between parent support, maternal self-harm, maternal depression, harsh parenting, family invalidation, family non-intactness and lack of parental care.</li> <li>● Two samples found associations with parental mental health problems.</li> <li>● For peer NSSI, 4/6 found an association.</li> <li>● For life events 2/4 found an association.</li> <li>● One sample found a significant association with attachment and 2/3 found an association with support and 2/5 showed associations with relationship problems.</li> <li>● With regard to psychological factors, 11/14 found an association with depression, 4/5 with general psychological distress, 3/4 with conduct problems, 1/2 with anxiety, 4/6 with emotional problems and two samples found a significant relationship with borderline personality disorder.</li> <li>● 8/10 found an association with previous NSSI, 3/5 with impulsivity, and 2/4 with substance abuse.</li> <li>● 4/6 found an association with self-concept related variables, 3/4 with cognitive style and 4/8 found associations with good coping and problem-solving skills.</li> </ul>

Note: please refer to the abbreviations section of the paper.

in the outcome whereas for the remaining four studies (Carballo et al., 2020; Grandclerc et al., 2016; Quarshie et al., 2020; Rahman et al., 2021), the outcome was self-harm, regardless of motive (See Supplementary Material 6). Fig. 4 lists the same risk factors (and in the same order) as Fig. 2 but compares how often they were identified by one of the eight reviews (Abdelraheem et al., 2019; Aggarwal et al., 2017; Bozzini et al., 2021; Cipriano et al., 2017; Li et al., 2012; Miranda-Mendizábal et al., 2019; Rojas-Velasquez et al., 2020; Valencia-Agudo et al., 2018) as being associated with NSSI or SSI.

There was strong evidence from these eight reviews to show that NSSI and SSI do share many of the same risk factors. Some factors, like lack of friends, being involved in violence and school truancy/drop-out were identified as being associated only with SSI; whereas, other factors like harsh parenting, racism or attachment issues were identified as being associated with only NSSI. However, some factors, like poor academic performance, was only identified as a risk factor in reviews

where the motive was not specified.

### 3.5. What are the most important protective factors for self-harm in AYAs that have been identified by systematic reviews in the literature?

Protective factors for self-harm were identified much less frequently than risk factors. Only five (Abdelraheem et al., 2019; Aggarwal et al., 2017; Cipriano et al., 2017; Rojas-Velasquez et al., 2020; Valencia-Agudo et al., 2018) of the included 12 general systematic reviews identified any protective factors (see Supplementary Material 6). For this reason, it was not possible to categorise the protective factors in the same way that was completed for risk factors. Fig. 5 presents the ranking of the number of times a protective factor has been identified by the 5 general reviews (Abdelraheem et al., 2019; Aggarwal et al., 2017; Cipriano et al., 2017; Rojas-Velasquez et al., 2020; Valencia-Agudo et al., 2018) that identified protective factors associated with self-harm



**Table 2**  
General Systematic Reviews with meta-analyses.

Systematic Review	Number of primary studies	Search dates	Number of Databases searched: and list	Outcome	Age cohort (specified?)	Main findings for risk/protective factors	Pooled OR	95% CI	I <sup>2</sup>
Li et al. (2012)	43 studies (n = 192,362)	up to January 2011	4: PubMed, EMBASE, CNK, and VIP	SI, SA and SD but only SA reported here	General age group (some meta-analyses were specific to AYAs) AYAs aged 12-26	<b>Risk Factors for SA</b> Alcohol drinking <i>All other pooled ORs included non-AYA studies so are not shown here</i>	2.5	1.86–3.36	0%
Miranda-Mendizábal et al. (2019)	77 published papers (67 studies)	up to January 2017	5: Medline, Embase, Web of Science, The Cochrane Library, PsycInfo, OpenGrey	Suicide attempts and death		<b>Risk Factors for SA</b> Being female Note this study stratified risk factors for gender and classified them into different categories <i>Individual negative life events and family adversity</i> Bullying (females) Bullying (males) Childhood maltreatment (females) Childhood maltreatment (males) Community violence (females) Community violence (males) Dating violence (females) Dating violence (males) Parental separation (females) Parental separation (males) Family history of mental disorders/abuse (female) Family history of mental disorders/abuse (males) Previous suicidal behaviour in family (females) Previous suicidal behaviour in family (males) Interpersonal difficulties (females) Interpersonal difficulties (males)  <i>Psychiatric and psychological</i> Alcohol abuse disorder (females) Alcohol abuse disorder (males) Anxiety disorder (female) Anxiety disorder (male) Any mental health disorder/abuse (female) Any mental health disorder/abuse (male) Bipolar disorder (female) Bipolar disorder (male) Drug abuse disorder (female) Drug abuse disorder (male)	1.96 6.30 3.80 3.77 2.76 1.68 1.83 2.19 Not significant Not significant 1.56 2.27 2.63 Not significant 2.84 1.13 Not significant 2.69 2.14 2.03 3.79 3.37 4.23 1.43 No data 4.44 3.11	1.54–2.50 1.53–25.90 1.01–14.30 2.13–6.68 1.20–6.36 1.42–1.99 1.48–2.26 1.29–3.71   1.01–2.41 1.78–2.89 1.99–3.47  1.87–4.33 1.03–1.24  1.32–5.50 1.09–4.20 1.77–2.33 2.05–7.01 2.52–4.51 3.28–5.47 1.20–1.70  2.51–7.83 2.01–4.84	73% NA NA 70% 73% 0% 0% 0%   73% 19% 99%  42% 0%  0% 0% 0% 92% 88% 1% 0%  72% 0%

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Table 2 (continued)

Systematic Review	Number of primary studies	Search dates	Number of Databases searched: and list	Outcome	Age cohort (specified?)	Main findings for risk/protective factors	Pooled OR	95% CI	I <sup>2</sup>
						Eating disorder (female)	5.27	2.04–13.60	0%
						Eating disorder (male)	No data		
						Major depressive disorder (female)	4.49	2.18–9.23	78%
						Major depressive disorder (male)	6.07	1.74–21.20	84%
						Personality disorder (female)	7.89	3.81–16.35	0%
						Personality disorder (male)	5.13	2.63–10.01	0%
						PTSD (female)	2.96	1.32–6.62	39%
						PTSD (male)	Not significant		
						Previous SI (female)	4.39	2.31–8.34	78%
						Previous SI (male)	3.97	1.40–11.24	85%
						Previous SA (female)	6.96	3.75–12.91	58%
						Previous SA (male)	31.33	9.36–104.8	0%
						Depressive symptoms (female)	1.15	1.04–1.28	67%
						Depressive symptoms (male)	Not significant		
						Disruptiveness (female)	Not significant		
						Disruptiveness (male)	8.78	2.77–27.84	76%
						Hopelessness (female)	Not significant		
						Hopelessness (male)	1.74	1.04–2.94	0%
						<i>Personal</i>			
						Abortion (female)	1.3	1.09–1.55	0%
						Abortion (male)	No data		
						<i>Community</i>			
						Access to means (female)	Not significant		
						Access to means (male)	1.6	1.04–2.45	NA
						Suicidal behaviour of a friend (female)	Not significant		
						Suicidal behaviour of a friend (male)	1.65	1.07–2.56	0%

## Notes:

- please refer to the abbreviations section of the paper.
- N/A for I<sup>2</sup> indicates one sample is reported.
- All percentages for I<sup>2</sup> are rounded to nearest whole no.
- \* This effect size is a pooled OR unless stated otherwise.

in AYAs. We can see that having good social, family and friend supports appeared to be the most frequently identified protective factors. Furthermore, two factor-specific reviews reported pORs for protective factors: Chui et al. reported a pOR of 0.52 (0.41–0.66) between good sleep and suicide attempts (Chiu et al., 2018); and, Marraccini and Brier reported a pOR of 0.59 (0.49–0.70) between having a good school connectedness and suicide attempts (Marraccini and Brier, 2017).

#### 4. Discussion

This umbrella review identified multiple risk factors for self-harm in the AYA population. It also identified the risk factors most frequently associated with, and having the strongest evidence for an association with, self-harm in AYAs. In particular, psychiatric or psychological and ALE risk factors were the two categories that were most frequently associated with self-harm in AYAs. The most frequently identified risk factor for self-harm was childhood abuse/neglect and the three highest pooled odds ratios (pORs) for self-harm reported were from the psychiatric/psychological category: that is, for conduct/behavioural issues,

personality disorders, and depression or anxiety (Miranda-Mendizábal et al., 2019; Pozuelo et al., 2021). In addition, substance use/abuse and having poor family relationships were also frequently associated with self-harm in AYAs across systematic reviews.

It was also clear from the collated evidence that even if we do separate self-harm into the two sub-categories of non-suicidal and suicidal self-harm (NSSI and SSI), they share many of the same risk factors. Nine out of ten of the top ten most identified risk factors for self-harm identified in Fig. 2 were specifically identified as being associated with both NSSI and SSI in Fig. 4. Only the risk factor of lack of friends or being unpopular was associated with SSI in two reviews but not associated with NSSI in any reviews. But even in this case, this risk factor was identified with self-harm (where the motive was not specified) in three reviews (See Supplementary Material 6); hence, it is possible that it is also associated with NSSI. Altogether, the evidence from this review suggests that the risk factors are the same for self-harm, regardless of the motive.

Psychiatric and psychological risk factors have been highlighted as some of the strongest risk factors for self-harm in young people. Out of

Table 3

Factor specific Systematic Reviews with no meta-analyses.

Systematic Review	Number of primary studies	Search dates	Number of Databases searched: and list	Specified risk/ protective factor	Outcome	Age cohort (specified?)	Main findings for risk/ protective factors
<a href="#">Bottino et al. (2015)</a>	10	up to May and June 2013 (completed twice)	2: PubMed and Virtual Health Library.	Cyber bullying and traditional bullying.	Mental health outcomes (SA and SI included)	Youth aged 10 to 17.	<ul style="list-style-type: none"> <li>● Cyberbullying was a predictor of SAs: cyberbully victims were 1.9 times more likely and cyberbully offenders were 1.5 times more likely to have a SA than non-victims and non-offenders, respectively (<a href="#">Hinduja and Patchin, 2010</a>).</li> <li>● Adolescents who were victims of cyberbullying and traditional school bullying reported higher scores on the SI and suicidal behaviour scale (OR = 1.5), as well as more suicide attempts that demanded medical treatment (OR = 2.1).</li> <li>● The likelihood of attempting suicide was up to twice as high among victims and aggressors, as compared to those not involved in cyberbullying (OR = 1.5; OR = 2.1, respectively) (<a href="#">Hinduja and Patchin, 2010</a>).</li> </ul>
<a href="#">Conti et al. (2017)</a>	17 studies	up to February 2017	6: PubMed, Scopus, Web of Science, PsycInfo, Google Scholar, and ScienceDirect	Binge eating disorder	Suicidality (SI or SA or SD) SAs could be identified as a sub-outcome	All ages but adolescents are a sub-group	<ul style="list-style-type: none"> <li>● Examined wider suicidality and suicidal behaviours.</li> <li>● SAs were identifiable as a sub-outcome.</li> <li>● Binge disorder eating was associated with SAs in adolescents</li> <li>● Two ORs mentioned are 3.1 (<a href="#">Ackard et al., 2011</a>) and 5.01 (<a href="#">Forest et al., 2017</a>; <a href="#">Ackard et al., 2011</a>; <a href="#">Forrest et al., 2017</a>).</li> </ul>
<a href="#">Daine et al. (2013)</a>	14 studies in 16 published papers	1991 to 2011	5: PsycInfo, MEDLINE, EMBASE, Scopus, and CINAHL	Internet use	Self-harm	Children, adolescents and young people	<ul style="list-style-type: none"> <li>● General internet use has been found to be associated with higher levels or self-harm.</li> <li>● Cyberbullying is associated with an increase in the rates of self-harm in both victims and perpetrators.</li> </ul>
<a href="#">Del Carpio et al. (2021)</a>	21 studies	up to May 2020	4: MEDLINE, PsycInfo, Web of Science, and Embase	Exposure to suicide in others or bereavement due to other forms of death	Self-harm and suicide (SD)	Adolescents aged 12–18 years old	<p><b>Outcome = hospitalisation due to self-harm (both NSSI and SA)</b></p> <ul style="list-style-type: none"> <li>● While there were mixed results, it appears from some of the studies that people suffering a suicide bereavement are at a higher risk of hospitalisation due to self-harm, compared with those not</li> </ul>

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Table 3 (continued)

Systematic Review	Number of primary studies	Search dates	Number of Databases searched: and list	Specified risk/protective factor	Outcome	Age cohort (specified?)	Main findings for risk/protective factors
							<p>suffering a suicide bereavement or a bereavement in general. But there were contradictory results on this.</p> <p><b>Outcome = self-reported self-harm (both NSSI and SA)</b></p> <ul style="list-style-type: none"> <li>● There were mixed results regarding whether those suffering a bereavement due to suicide were at a higher risk of self-harm or suicide attempt compared to those suffering a bereavement due to another cause of death.</li> <li>● A common finding was that the higher risk was in the first two years following the bereavement due to any cause.</li> <li>● Children who were maltreated were at an increased risk of SAs with those that have experienced child sexual or physical abuse having a four-fold increased risk.</li> <li>● Witnessing parental domestic violence as a child also increased the risk of suicide ideation in adolescents.</li> </ul>
Fry et al. (2012)	364 publications with 106 studies on the consequence of childhood maltreatment 15 studies considered SI and SA	January 2001–November 2010	16: including PubMed/Medline, ProQuest, PsycInfo, ScienceDirect, CINAHL-ebSCO, EMBASE, ERIC, NCJRS, Violence and Abuse Abstracts, Social Work Abstracts, SocIndex, Family and Society Studies Worldwide, Google, Google Scholar, SSCI, and Korea Med	Child maltreatment (in the East Asia and Pacific Region)	General health outcomes but SI and SAs considered as sub-outcomes	Children are dealt with as a sub-age-group	<ul style="list-style-type: none"> <li>● Nine studies with moderate risk of bias (ROB) indicated a significantly increased risk of offspring SA among those exposed to maternal SA and SD in childhood or adolescence.</li> <li>● When the father was reported to exhibit the STB, the risk of SA in offspring was less conclusive.</li> <li>● All studies examining the association between exposure to any type of parental psychopathology and offspring suicide were significant with large magnitude.</li> <li>● 80% of the included studies showed a high ROB.</li> <li>● Two cross-sectional studies by Young et al. (Young et al., 2006, 2014) found that those who at least</li> </ul>
Goodday et al. (2019)	54 studies	up to March 2017	5+: including MEDLINE, CINAHL, EMBASE, PsycInfo, Web of Science	Psychopathology in parents	STB SA included as a sub-outcome	People under 25 years	<p>(continued on next page)</p>
Hughes et al. (2018)	12 studies (10 quantitative and 2 qualitative)	up to December 2017	5: PsycInfo, Scopus, MEDLINE and Web of Science, and the E-Thesis online service (ETHOS)	Alternative subcultures identity (e.g. Goth, emo, punk) or a preference	Self-harm (NSSI and SA)	All studies focused on AYAs aged 14–24 except one study	

Table 3 (continued)

Systematic Review	Number of primary studies	Search dates	Number of Databases searched: and list	Specified risk/protective factor	Outcome	Age cohort (specified?)	Main findings for risk/protective factors
				for alternative music (e.g. Heavy Metal)		based on 24-35-year olds.	moderately self-identified with an alternative subculture (goth, emo, punk Mosher) had more than three times the odds of endorsing self-harm (OR = 3.49–14.16), NSSI (OR = 3.56–3.92)), and around six times the odds of having attempted suicide (OR = 5.96). ● Small but positive correlations were reported between a preference for heavy metal music and self-harm.
Kearns et al. (2020)	10 studies	up to December 2017	3: PsycInfo, PubMed, and Web of Science	Sleep problems	STB (SA was a sub-outcome)	Adolescents aged 10-24	● Four out of six studies showed a significant relationship between sleep problems and SA.
Khazaie et al. (2020)	16 studies	up to October 2018	2: PubMed and Embase	Sleep problems	NSSI	All ages but AYA examined as a sub-group	● 10 out of 16 of the included studies are from the AYA age cohort. ● AYAs with sleep disruptions were at a higher risk of NSSI compared to those without sleep disruptions.
Lewis and Seko (2016)	27 studies	up to July 2015	7: MEDLINE, EMBASE, PsycInfo, CINHAL, Web of Science, Cochrane Library and Social Work Abstracts	Engagement with online activity pertinent to NSSI	NSSI	Not clear but it does mention that AYAs have higher rates of NSSI and internet use	● Online NSSI activity represents a may provide both benefits and risks to individuals who engage in NSSI. ● The benefits include the mitigation of social isolation and social support (20/27 studies), NSSI recovery encouragement (9/27 studies), curbing NSSI urges (7/27 studies) and emotional disclosure (8/27 studies). ● The risks include NSSI reinforcement via the normalisation of NSSI or the validation of NSSI identity (22/27 studies), triggering NSSI urges (11/27 studies), and stigmatising NSSI (5/27 studies).
Lockwood et al. (2017)	28 studies	up to July 2015	6: EMBASE, MEDLINE, PsycInfo, CINAHL, PubMed and The Cochrane Library,	Impulsivity	Self-harm behaviours	Adolescents aged 11–25 years	● 24 out of 28 studies found an association between impulsivity and self-harm. ● Most studies (18/28) used the NSSI as the definition of self-harm. ● Lifetime NSSI was most consistently associated with mood-

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Table 3 (continued)

Systematic Review	Number of primary studies	Search dates	Number of Databases searched: and list	Specified risk/protective factor	Outcome	Age cohort (specified?)	Main findings for risk/protective factors
Mento et al. (2020)	15 studies	Unclear	1: PubMed	Psychological pain	Suicidal ideation and behaviour	Adolescents	<ul style="list-style-type: none"> <li>● based impulsivity-related traits.</li> <li>● Psychological pain was associated with SAs in adolescents.</li> </ul>
Milde et al. (2021)	6 studies	up to September 2018	5+: PsycInfo, Web of Science, Medline, ERIC and the Cochrane Central Register of Controlled Trials	Being a child welfare client (in-home, out-of-home, or aftercare) in Nordic countries (i.e., Denmark, Finland, Iceland, Norway and Sweden)	SD or suicidal behaviour (specifically acts - SI or threats were excluded)	Children up to 18 years of age	<ul style="list-style-type: none"> <li>● Suicidal behaviour was highlighted in three studies. All child welfare service interventions resulted in a four to fivefold risk of being hospitalized for SA compared to the general population.</li> </ul>
Miller et al. (2013)	52 studies	unclear	3: PsycInfo, PsychARTICLES, and MEDLINE	Child maltreatment (sexual abuse, physical abuse, emotional abuse, and neglect)	Suicidal behaviour (SI, SA and SD) Included since specifies SA as sub-outcome	Predominantly of adolescents ages 12–17	<ul style="list-style-type: none"> <li>● Eight longitudinal and 28 cross-sectional studies yielded evidence that childhood sexual abuse predicts future SI and/or SAs in adolescence.</li> <li>● 16/18 cross-sectional and six longitudinal studies conducted with community samples revealed a positive relationship between childhood physical abuse and SI and/or SAs.</li> <li>● Seven cross-sectional studies (six community- and one clinically based) found significant relationships between neglect and/or emotional abuse, and adolescent suicidal ideation or behaviour.</li> <li>● There were mixed results for emotional abuse and suicidal ideation or behaviour.</li> </ul>
Moller et al. (2013)	42 articles (36 studies)	January 2001 to January 2011	2: MEDLINE and PsycInfo	Substance abuse	DSH	Majority of studies were from AYA samples. 31/36 samples were based in schools or universities	<ul style="list-style-type: none"> <li>● Nearly all the studies identified in this systematic review report significant relationships between DSH and substance use.</li> <li>● 24/29 studies found an association between DSH and illicit drugs.</li> <li>● 21/34 studies found an association between DSH and alcohol use.</li> <li>● 19/23 studies found an association between DSH and tobacco use.</li> </ul>
Moselli et al. (2021)	33 studies	1980–2020	1: PubMed	Personality disorders	SD and SAs SA and suicidal conduct was a sub-outcome that could be identified	Adolescents aged 13–18 years old	<ul style="list-style-type: none"> <li>● Personality traits supposed to underlie BPD, such as affective instability, impulsivity and identity diffusion, have specific predictive links with suicidal conduct.</li> <li>● Other personality pathology</li> </ul>

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Table 3 (continued)

Systematic Review	Number of primary studies	Search dates	Number of Databases searched: and list	Specified risk/protective factor	Outcome	Age cohort (specified?)	Main findings for risk/protective factors
							<p>dimensions, such as aggressiveness, sadism and perfectionism that are associated with other personality disorders, namely, antisocial and narcissistic personality disorders, have also shown a significant mediating role for suicidal risk.</p> <ul style="list-style-type: none"> <li>● The presence of any personality disorder was found in 19.5–22.8% of adolescents who attempted suicide and in 29.6–42.1% of adolescent suicide victims.</li> </ul>
Nagraj and Omar (2017)	9 studies (N = 1,100,316)	up to December 2014	1: PubMed	Disability (mental and/or physical)	SD or self-harm SA is a sub-outcome	Adolescents	<ul style="list-style-type: none"> <li>● As compared to adolescents without physical disabilities, adolescents with physical disabilities were significantly more likely to die by suicide or to exhibit suicidal behaviour</li> <li>● This review also found an increased risk of death by suicide in adolescents with intellectual disabilities.</li> <li>● Studies that examined adolescents with learning disability suggested that there was a significantly increased risk of SD in adolescents with learning disability as compared those without.</li> </ul>
Perez-Gonzalez and Pereda (2015)	16 studies	1986 to June 2013	3: PsycInfo, Scopus and MEDLINE Web of Science	Childhood sexual abuse	SI, SA or SPs SA identifiable sub-outcome	Children and adolescents with mean age 18 years or maximum age 25 years	<ul style="list-style-type: none"> <li>● The victims of childhood sexual abuse have a 3- to 4-fold higher risk of SA than non-victims.</li> </ul>
Plöderl and Tremblay (2015)	199 studies	up to December 2014	1: PubMed	Being LGB	Mental health outcomes (SA and SD were sub-outcomes)	General but adolescents identified as a subgroup	<ul style="list-style-type: none"> <li>● Nearly all adolescent study results (98%) indicated elevated SA rates for LGB adolescents.</li> </ul>
Quigley et al. (2017)	86 studies	up to July 2015	4: Web of Science, PsycInfo, PubMed, and Embase	Exposure to self-harm and suicidal behaviour (social contagion)	Suicidal or self-harming behaviour (SSHB) regardless of intent	Children and adolescents aged 5–19 years	<ul style="list-style-type: none"> <li>● 23 papers examined exposure to suicidal or self-harming behaviour (SSHB) in the family and 20/23 reported a positive association; that is, those with a family history of SSHB were repeatedly found to be more likely than those without, to engage in the same behaviour themselves.</li> <li>● Associations between offspring SSHB and maternal SSHB appeared to be</li> </ul>

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Table 3 (continued)

Systematic Review	Number of primary studies	Search dates	Number of Databases searched: and list	Specified risk/protective factor	Outcome	Age cohort (specified?)	Main findings for risk/protective factors
Sedgwick et al. (2019)	9 studies N = 346,416	up to January 2019	5: Medline, PsycInfo, EMBASE, HMIC and CINAHL	Social media and internet use	SA and SD	Adolescents aged 11–18 years old	<p>stronger than that with fathers' or other relatives' SSHB.</p> <ul style="list-style-type: none"> <li>● Only one paper was longitudinal and it found that older sibling SI predicted younger sibling SI.</li> <li>● 16 papers explored associations between child/adolescent SSHB and that of their friends or peers: 11/16 reported a positive association.</li> <li>● An independent direct association was found between heavy social media/internet use and increased SAs in 7/9 studies (adjusted ORs ranged from 1.03 to 5.10), although adjusting for cyberbullying victimisation and sleep disturbance reduced the strength of this association</li> <li>● 2/9 studies found that social media/internet use (versus no use) may be associated with fewer suicide attempts.</li> </ul>
Serafini et al. (2021)	29 studies	up to January 2021	3: PubMed, Scopus and Science Direct	Bullying (victimisation and perpetration)	NSSI and suicidal behaviour	AYAs aged 10–24 years old	<ul style="list-style-type: none"> <li>● All studies dealt with bullying victimisation and four studies also dealt with bullying perpetration.</li> <li>● A positive association was found between both bullying victimisation and perpetration and NSSI and suicidal behaviour (i.e. an increase in one was associated with an increase in the other).</li> </ul>
Serafini et al. (2017)	26 studies	1980 to 2016	4: PubMed, Scopus, Science Direct, and PsycInfo	Childhood maltreatment	NSSI and suicidal behaviour	General - but the majority of studies were for AYAs	<ul style="list-style-type: none"> <li>● Childhood maltreatment is a significant risk factor for NSSI and SAs – in particular, childhood sexual abuse.</li> <li>● The association is stronger for females than males.</li> </ul>
Woo et al. (2020)	22 studies	up to March 2020	3: PubMed, OVID, and PsycInfo	Attachment (insecurity) issues	SIB	Up to 20 years old	<ul style="list-style-type: none"> <li>● The majority of studies (21/22) reported significant associations between attachment style and NSSI and/or SA or SIB.</li> <li>● SIB was associated with general attachment insecurity, and specifically with attachment anxiety and avoidance.</li> </ul>

Notes: please refer to the abbreviations section of the paper.



**Table 4**  
Factor specific Systematic Reviews with meta-analyses.

Systematic Review	Number of primary studies	Search dates	Number of Databases searched: and list	Specified risk/ protective factor	Outcome	Age cohort (specified?)	Main findings for risk/protective factors	Effect size*	95% CI	I <sup>2</sup>
Angelakis et al. (2020)	79 studies N = 337,185	January 1980 until December 2019.	5: Medline, PsycInfo, Embase, Web of Science, and CINAHL.	Sexual, physical or, emotional abuse in childhood and adolescence.	SI, SA and SPs	People aged 5–24 who experienced abuse/neglect before 18 years	<b>Risk Factors for SAs</b> Sexual abuse Physical abuse Emotional abuse Emotional neglect Physical neglect Overall child abuse	3.41 2.18 2.21 1.93 1.79 3.38	2.90–4.00 1.75–2.71 1.37–3.57 1.36–2.74 1.27–2.53 2.09–5.47	97% 90% 96% 92% 92% 93%
Batejan et al. (2015)	15 studies For N, >7000 LGBQ people and N > 61,000 heterosexual peoples	up to July 2012	5: PsycInfo, Medline, SocINDEX, ERIC and Web of Science	Being gay, lesbian, bisexual or questioning sexual identity (LGBQ)	NSSI	3 adolescent studies, 10 college student studies and 2 adult studies	<b>Risk Factors for NSSI (control group is being heterosexual)</b> Overall weighted effect size between being LGBQ Being gay/lesbian Being bisexual <i>There was a higher risk of NSSI in bisexual people compared to gay or lesbian people with OR = 2.36 (95% CI 2.00-2.78). No I<sup>2</sup> was calculated.</i>	3.00 1.91 4.37	2.46–3.66 1.66–2.19 3.95–4.84	– – –
(Castellvi et al., 2017a)	31 Qualitative and 29 Quantitative studies N = 1,122,054	up to June 2015	6: Cochrane Library, Embase, Medline, PsycInfo, Web of Science and OpenGrey	Self-injurious thoughts and behaviours (SITB)	SD or SA	People aged 12–26 years old	<b>Risk Factors for future SAs</b> SI SA Suicidal behaviour Overall SITB NSSI Pooled non-variables (including threats) suicidal	3.26 5.56 4.26 3.88 2.26 1.78	2.26–4.70 3.32–9.30 2.05–8.84 2.91–5.17 1.26–4.07 1.04–3.05	92% 66% 0% 87% 75% 77%
Castellví et al. (2020)	14 studies Qualitative synthesis (13 datasets) N = 62,298	up to January 2017	6: Cochrane Library, PubMed/Medline, PsycInfo, EMBASE, Web of Science, and OpenGrey.	School failure (low academic performance, school dropout, and school expulsion)	SA or SD	People aged 12–26 years old	<b>Risk Factors for SA</b> History of school dropout Low academic performance Overall school failure <i>School expulsion was found to be a non-significant risk factor.</i>	6.44 1.48 1.98	3.03–13.65 1.22–1.81 1.49–2.64	36% 44% 73%
(Castellvi et al., 2017b)	34 studies N = 143,730	up to June 2015	6: Cochrane Library, PubMed, PsycInfo, EMBASE, Web of Science, and OpenGrey.	Interpersonal violence	SA or SD	People aged 12–26 years old	<b>Risk Factors for SA</b> Child maltreatment Bullying Dating violence Community violence Overall violence	2.25 2.39 1.65 1.48 1.99	1.85–2.73 1.89–3.01 1.40–1.94 1.16–1.87 1.73–2.28	88% 2% 0% 77% 85%

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Table 4 (continued)

Systematic Review	Number of primary studies	Search dates	Number of Databases searched: and list	Specified risk/ protective factor	Outcome	Age cohort (specified?)	Main findings for risk/protective factors	Effect size*	95% CI	I <sup>2</sup>
<a href="#">Cheek et al. (2020)</a>	56 studies	up to March 2020	3: PsycInfo, MEDLINE, and CINAHL	Social rejection, popularity and peer victimisation	SI, SA and NSSI	Teenager, youth and adolescent	<b>Risk Factors for SA</b> Bullying Relationship victimisation <b>Risk Factors for NSSI</b> Bullying <i>No study found an association between relationship victimisation and NSSI. All three studies that examined adolescents' popularity and suicide attempt found an association.</i> <i>Three out of four studies found no association between peer preference and NSSI.</i> <i>Two out of the three studies that studied the association between parental rejection and suicide attempt found an association existed.</i>	2.14 2.38 2.99	1.73–2.65 1.42–3.98 2.12–4.20	– – –
<a href="#">Chiu et al. (2018)</a>	10 studies N = 598,281	up to April 2017	6: EMBASE, PubMed, PsycInfo, ProQuest Dissertations & Theses A&I, Wanfang Data, and the China Knowledge Resource Integrated Database	Sleep duration (protective factor)	SI, SP and SA	Yes – use of the term 'adolescent' (mean age 15.5 years)	Longer sleep duration and SA <i>A non-linear U-shaped dose-response relationship was also observed with respect to sleep duration and suicidal ideation, plans and attempts with 8-9 h of sleep having the lowest odds ratios for suicide planning and attempts.</i> <i>The above has an 80% credibility interval</i>	0.52 -	0.41–0.66 0.13–0.60	79% 94%
<a href="#">Evans et al. (2017)</a>	5 studies	up to November 2014	14: ASSIA; CINAHL; EMBASE; EPPI Centre DoPHER; HMIC; MEDLINE; MEDLINE; OpenGrey; PsycInfo; Social Care Online; Social Science Citation Index & Conference Proceedings Citation Index – Science and Social Science & Humanities; Social Services Abstracts; Sociological Abstracts; Scopus.	Being in foster care or supervision at a home care	SI, SA and SD	Children and young people	Being in-care (outcome = SA)	3.89	3.14–4.83	41%
<a href="#">Geulayov et al. (2012)</a>	28 studies (14 for the meta-analysis)	up to April 2011	4: Medline, PsycInfo, EMBASE, Web of Science	Parental fatal or non-fatal suicidal behaviour	SA and SD	Children (age ranges not specified) we assume <18 years	<b>Risk Factors for SA</b> Parental SD (crude OR) Parental SD (adjusted OR) Parental SA (crude OR) Parental SA (adjusted OR)	3.28 1.61 3.74 2.06	3.05–3.52 1.40–1.84 3.54–3.95 1.92–2.21	– 84% – 75%

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Table 4 (continued)

Systematic Review	Number of primary studies	Search dates	Number of Databases searched: and list	Specified risk/ protective factor	Outcome	Age cohort (specified?)	Main findings for risk/protective factors	Effect size*	95% CI	I <sup>2</sup>
							Parental suicidal behaviour (crude OR)	3.48	2.69–4.51	–
							Parental suicidal behaviour (adjusted OR)	1.60	1.18–2.17	N/A
							Parental SD (as compared to a group with parental death from another cause – crude OR)	1.73	1.63–1.83	–
							<i>Parental suicidal behaviour as a risk factor grouped SA and SD together as one exposure. Not all results for heterogeneity I<sup>2</sup> were reported. Some meta-analyses had adjustments for confounders e.g. parental history of psychiatric disorder or parental sociodemographic factors.</i>			
Gili et al. (2019)	24 studies N = 25,354	up to January 2017	5: Cochrane Library, Embase, Medline, PsycInfo and Web of Science	Mental disorders	SA and SD	12–26 years old	Mental disorder (outcome = SA)	3.56	2.24–5.67	96%
Gobbi et al. (2019)	11 studies N = 23,317	up to January 2017	5: Medline, Embase, CINAHL, PsycInfo, and Proquest Dissertations and Theses	Cannabis use in people less than 18 years	Depression, Anxiety, and Suicidality	Young adults aged 18–32 years old	Cannabis use (outcome = SA)	3.46	1.53–7.84	61%
Haney (2020)	15 studies N = 24,996 (9 studies relevant N = 23,465)	up to November 2017	4: PsycInfo, PubMed, Google Scholar, and Educational Resources Information Center	Religion (beliefs, practice or both) (protective factor)	NSSI	General age cohort (9 studies in the AYA range)	<i>There were 9/15 studies that studied AYAs. I<sup>2</sup> was 85% for all studies so there was high heterogeneity. Seven out of nine studies had a statistically significant correlation coefficient (p &lt; 0.05) ranging from -0.343 to 0.427. Only one of seven showed a positive correlation coefficient and this had a small n=33 sample size and only included women. In conclusion there was some small evidence that religion is a protective factor for NSSI in AYAs.</i>			
Heerde and Hemphill (2019)	27 studies N = 156,284	1990–2018	14: psychology, health, social science, medicine, social work, criminology, and education electronic databases	Bullying	DSH	Adolescents aged 11–19 years old	Bullying (traditional) perpetration	1.81	1.33–2.47	94%
							Bullying (traditional) victimisation	2.34	1.89–2.89	98%
							Cyber bullying victimisation	3.55	2.71–4.65	92%
							Bullying (cyber and traditional) victimisation	3.39	1.56–7.37	98%
Holt et al. (2015)	47 studies (from 46 papers)	1990–July 2013	5+: PubMed, PsycInfo, Education Resources Information Center, Cumulative Index to Nursing and Allied Health Literature, and ProQuest Dissertations and Theses	Bullying	SI and suicidal behaviours (SAs)	Children and adolescents	<b>Outcome = suicidal behaviour (SAs)</b>			
							Bullying victimisation	2.94	2.36–3.67	24%
							Bullying perpetration	2.62	1.51–4.55	91%

All I<sup>2</sup> values reported here are at the study level.  
(continued on next page)

Table 4 (continued)

Systematic Review	Number of primary studies	Search dates	Number of Databases searched: and list	Specified risk/protective factor	Outcome	Age cohort (specified?)	Main findings for risk/protective factors	Effect size*	95% CI	I <sup>2</sup>
John et al. (2018)	20 independent studies (25 articles) N = 115,056	1996 to February 2017	6+: Cochrane Library, Medical Literature Analysis and Retrieval System Online, PROSPERO, PsycInfo, PubMed, and Scopus.	Cyberbullying	Self-harm or suicidal behaviour	Under 25 years of age	Cyberbullying victim (risk factor) outcome = self-harm outcome = suicidal behaviours outcome = SA Cyberbullying perpetrator (risk factor) outcome = suicidal behaviours <i>There were five studies that showed no significant associations between cyberbullying and self-harm or suicidal behaviour.</i>	2.35 2.10 2.57 1.21	1.65–3.34 1.73–2.55 1.69–3.90 1.02–1.44	94% 92% 95% 72%
Liu et al. (2019)	14 studies N = 46,911	up to October 2018	4: Embase, PubMed, ProQuest, and the China Knowledge Resource Integrated Database	Sleep disturbances (e.g. insomnia)	SI and SA	Adolescents	<i>Both prospective studies and one retrospective did not find a significant association between sleep disturbances and SA.</i>			
Marraccini and Brier (2017)	20 publications (17 samples) with 19 publications (16 samples) having sufficient data to be used	up to July 2016	3: PsycInfo, Academic Search Premier, and PubMed	School connectedness (protective factor)	SI, SA, STB	Youths enrolled in school	School connectedness outcome = SA <i>School connectedness defined as having social affiliations, school belonging, having a positive attitude about school and supportive learning environment. 12 samples had SI as an outcome, 10 samples had SA as an outcome and 16 samples had any form of STB as an outcome.</i>	0.59	0.49–0.70	95%
Miranda-Mendizábal et al. (2017)	14 studies	up to June 2015	6: Cochrane Library, Medline, PsycInfo, EMBASE, Web of Science, and OpenGrey	Being LGB	SA or SD	AYAs aged 12–26	<i>11 studies assessed being LGB as a risk factor for SA</i> <b>Outcome = SA</b> Being LGB Being gay/bisexual man (compared to heterosexual men) <i>Being a lesbian/bisexual woman (compared to being a heterosexual woman) was not found to be a significant risk factor.</i>	2.26 2.21	1.60–3.20 1.21–4.04	35% 31%
Moore et al. (2017)	165 articles (different outcomes)	up to February 2015	4: PubMed, EMBASE, ERIC and PsycInfo	Bullying	General outcomes but NSSI, SI and SA specified	Children and adolescents	Bullying outcome = NSSI outcome = SA	1.75 2.13	1.4–2.19 1.66–2.73	93% 96%
Pozuelo et al. (2021)	33 studies (30 for the meta-analyses) N = 35,918	up to April 2019	15: Child Development & Adolescent Studies, Cochrane Database of Systematic Reviews, Cumulative Index to Nursing and Allied Health Literature, Embase, Global Health,	Depression	Risk behaviours (self-harm and suicidal behaviour included)	Adolescents in LMICs aged 10–24 years old	Depression outcome = self-harm outcome = suicidal behaviour (in comparison to	4.4 6.6	1.3–14.4 2.3–18.9	0% 0%

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Table 4 (continued)

Systematic Review	Number of primary studies	Search dates	Number of Databases searched: and list	Specified risk/protective factor	Outcome	Age cohort (specified?)	Main findings for risk/protective factors	Effect size*	95% CI	$I^2$
			MEDLINE, PsycInfo, Scopus, Social Science Citation Index/Web of Science, WHO Library Database, and World Bank Library, OpenGrey, British Library for Development Studies, Eldis, and GoogleScholar				healthy adolescents)			
Qu et al. (2021)	16 studies	up to September 2019	7: PubMed, Web of Science, the Cochrane Library, BIOSIS Previews, China National Knowledge Infrastructure (CNKI), Wanfang Database, and Chinese Biomedical Database (CBM)	Being a left behind child or adolescent after a parent migrates (in China)	SI, SP, and SA	Children and adolescents up to 19 years old	Despite higher rates of SI, SP, and SA found among left-behind children, compared with non-left-behind children, there was only evidence of an association with SI			
Soto-Sanz et al. (2019)	9 studies	up to January 2017	6+: Cochrane Library, Embase, Medline, PsycInfo, and the Web of Science, and OpenGrey	Low self-esteem	SA	AYAs 12–26 years old	Low self-esteem (outcome SA) compared to those without low self-esteem	1.99	1.39–2.86	45%
van Geel et al. (2014)	36 studies	1990–2013	3: Ovid MEDLINE, PsycInfo, and Web of Science	Peer victimisation and cyberbullying	SI and SA	Adolescents and children aged 9–21 years	Peer victimisation outcome = SA	2.55	1.95–3.34	89%
Zatti et al. (2017)	7 studies	2005–September 2015	4: PubMed, PsycInfo, ISI and EMBASE	Childhood trauma (ACEs)	SA	No but 5/7 studies were specific to AYAs	<b>Outcome = SA</b> Sexual abuse in childhood Emotional abuse in childhood Physical abuse in childhood Physical neglect in childhood A broken home in childhood Emotional neglect in childhood was not statistically significant.	3.73 3.98 4.12 3.42 2.14	2.94–4.75 2.81–5.65 2.31–7.34 2.09–5.59 1.10–4.13	68% 0% 80% 0% NA
Zhang et al. (2019)	28 studies	up to January 2019	3: PubMed, Embase and PsycInfo	Asthma	Suicidality	No but adolescents identified as a subgroup	Asthma outcome = SA	1.67	1.39–1.99	43%

## Notes:

- please refer to the abbreviations section of the paper.
- N/A for  $I^2$  indicates one sample is reported.
- All percentages for  $I^2$  are rounded to nearest whole no.
- \* This effect size is a pooled OR unless stated otherwise.

**Table 5**

Risk and protective factors for self-harm – the number of times identified by general reviews and reported pooled odds ratios.

	Factor	No. general reviews	Lowest reported pOR (CI)	Highest reported pOR (CI)
<b>Psychiatric or psychological</b>	Depression/anxiety	8	1.15 (1.04–1.28) (Miranda-Mendizábal et al., 2019)	6.6 (2.3–18.9) (Pozuelo et al., 2021)
	Other psychiatric illness ii	7	1.43 (1.20–1.70) (Miranda-Mendizábal et al., 2019)	4.23 (3.28–5.47) (Miranda-Mendizábal et al., 2019)
	Exposure to NSSI/SA in others	5	1.60 (1.18–2.17) (Geulayov et al., 2012)	3.74 (3.54–3.95) (Geulayov et al., 2012)
	Personality disorder or BPD	4	5.13 (2.63–10.01) (Miranda-Mendizábal et al., 2019)	7.89 (3.81–16.35) (Miranda-Mendizábal et al., 2019)
	Conduct/Behavioural/Disruptive issues	4	N/A	8.78 (2.77–27.84) (Miranda-Mendizábal et al., 2019)
	Emotional distress/disorder	4	N/A	N/A
	Previous self-harm/SA behaviour	3	1.78 (1.04–3.05) (Castellví et al., 2017)	31.33 (9.36–104.8) (Miranda-Mendizábal et al., 2019)
	Family history of psychiatric illness	3	2.27 (1.78–2.89) (Miranda-Mendizábal et al., 2019)	2.63 (1.99–3.47) (Miranda-Mendizábal et al., 2019)
	Hopelessness/pessimism	3	Only one pOR listed	1.74 (1.04–2.94) (Miranda-Mendizábal et al., 2019)
	Impulsiveness	3	N/A	N/A
	Personality traits i	2	N/A	N/A
	Attachment issues	2	N/A	N/A
	ADHD or ADD	2	N/A	N/A
	Eating disorders (binge, anorexia etc.)	1	Only one pOR listed	5.27 (2.04–13.60) (Miranda-Mendizábal et al., 2019)
	Suicide by a friend/family member	1	1.61 (1.40–1.84) (Geulayov et al., 2012)	3.28 (3.05–3.52) (Geulayov et al., 2012)
	Low self-esteem or self-criticism	1	Only one pOR listed	1.99 (1.39–2.86) (Soto-Sanz et al., 2019)
	Access to means for self-harm/SA	1	N/A	N/A
	Anger issues	1	N/A	N/A
	Post-hospital-change in connectedness	1	N/A	N/A
	Poor self-coping/problem-solving	1	N/A	N/A
Self-identification with NSSI	1	N/A	N/A	
<b>Fixed or Physical</b>	Being female	3	Only one pOR listed	1.96 (1.54–2.50) (Miranda-Mendizábal et al., 2019)
	Sexual orientation	1	2.26 (1.60–3.20) (Miranda-Mendizábal et al., 2017)	3.00 (2.46–3.66) (Batejan et al., 2015)
	Chronic physical illness/pain	1	Only one pOR listed	1.67 (1.39–1.99) (Zhang et al., 2019)
	Impaired sleep problems	1	N/A	N/A
	Being male	1	N/A	N/A
	Increasing age in the AYA cohort	1	N/A	N/A
	Overweight/obesity	1	N/A	N/A
	Adopted	1	N/A	N/A
<b>Adverse life experiences</b>	Childhood neglect/(sexual) abuse	9	2.25 (1.85–2.73) (Castellví et al., 2017)	4.12 (2.31–7.34) (Zatti et al., 2017)
	Bullying or cyberbullying	7	1.75 (1.4–2.19) (Moore et al., 2017)	6.30 (1.53–25.90) (Miranda-Mendizábal et al., 2019)
	ACEs/ALEs/trauma (general)	7	Only one pOR listed	2.96 (1.32–6.62) (Miranda-Mendizábal et al., 2019)
	Parental divorce/separation	6	1.56 (1.01–2.41) (Miranda-Mendizábal et al., 2019)	2.14 (1.10–4.13) (Zatti et al., 2017)
	Violence or peer conflict (involved in)	4	1.48 (1.16–1.87) (Castellví et al., 2017)	1.83 (1.48–2.26) (Miranda-Mendizábal et al., 2019)
	Relationship problems/breakup	3	N/A	N/A
	Relationship victimisation	2	1.65 (1.40–1.94) (Castellví et al., 2017)	2.38 (1.42–3.98) (Cheek et al., 2020)
	Recent life events	2	N/A	N/A
	Family conflict or violence	2	N/A	N/A
	Stress due to migration issues	1	N/A	N/A
	Abortion	1	Only one pOR listed	1.3 (1.09–1.55) (Miranda-Mendizábal et al., 2019)
<b>Environmental/Social</b>	Poor family relationships	6	N/A	N/A
	Lack of friends or being unpopular	5	Only one pOR listed	1.13 (1.03–1.24) (Miranda-Mendizábal et al., 2019)
	Lower SES (real or perceived)	3	N/A	N/A
	Harsh/controlling parent (perceived)	3	N/A	N/A
	Discrimination/racism/culture-gap	2	N/A	N/A
	Academic stress	1	N/A	N/A
	Lower education of parent	1	N/A	N/A
	Not living with parents	1	N/A	N/A
	Poor neighbourhood safety	1	N/A	N/A
	Poor Parents Health	1	N/A	N/A
	Foster Care	0	Only one pOR listed	3.89 (3.14–4.83) (Evans et al., 2017)

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Table 5 (continued)

	Factor	No. general reviews	Lowest reported pOR (CI)	Highest reported pOR (CI)	
<b>Behavioural</b>	Substance use or abuse	Smoking	6	N/A	N/A
		Alcohol		2.14 (1.09–4.20) (Miranda-Mendizábal et al., 2019)	2.69 (1.32–5.50) (Miranda-Mendizábal et al., 2019)
		Drugs/cannabis		3.11 (2.01–4.84) (Miranda-Mendizábal et al., 2019)	4.44 (2.51–7.83) (Miranda-Mendizábal et al., 2019)
	Poor academic performance	3	Only one pOR listed	1.48 (1.22–1.81) (Castellví et al., 2020)	
	School truancy/drop-out	2	Only one pOR listed	6.44 (3.03–13.65) (Castellví et al., 2020)	
	Crime/anti-social	1	N/A	N/A	
	Risk taking or novelty seeking	1	N/A	N/A	
	Goth or alternative subculture	1	N/A	N/A	
Not being religious	1	N/A	N/A		
<b>Protective Factors</b>	Social Support	3	N/A	N/A	
	Strong family relationships/support	3	N/A	N/A	
	Strong coping skills/resilience	2	N/A	N/A	
	Having friends	1	N/A	N/A	
	Good academic achievement	1	N/A	N/A	
	Life Satisfaction	1	N/A	N/A	
	Religion (engagement with)	1	N/A	N/A	
	Good Sleep	0	N/A	0.52 (0.41–0.66) (Chiu et al., 2018)	
	Positive School Experience	0	N/A	0.59 (0.49–0.70) (Marraccini and Brier, 2017)	

Notes: (i) Includes socially prescribed perfectionism, neuroticism, interpersonal dependency (ii) Includes bipolar disorder.

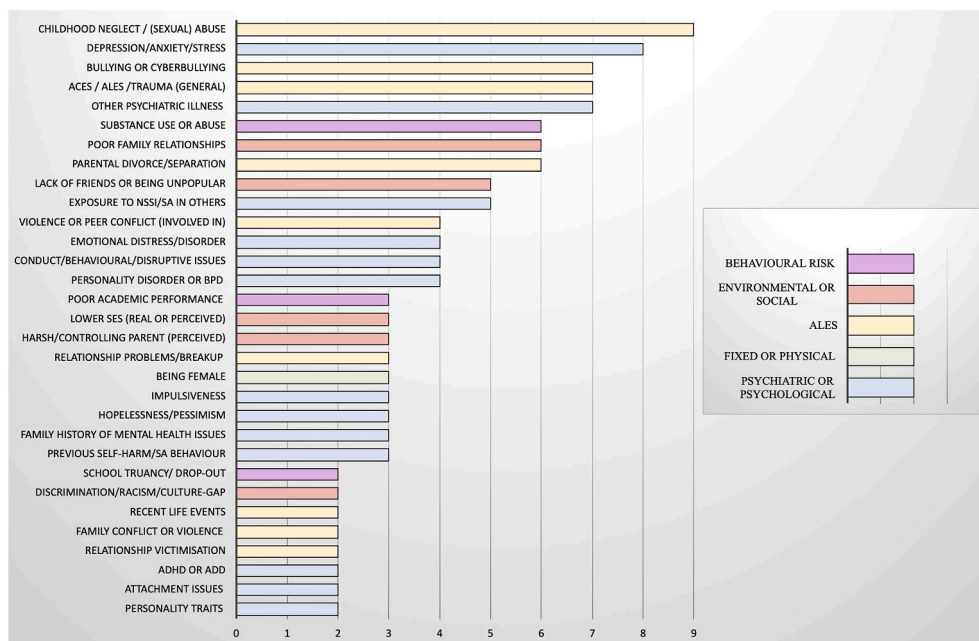


Fig. 2. The number of general systematic reviews that identified a risk factor at least two times where the outcome was self-harm (NSSI, SSI/suicide attempt, or self-harm where the intent was not specified).

the 20 risk factors identified with pooled odds ratios greater than two – excluding the risk factor of previous self-harm (since the exposure is the same as the outcome) – nine of these 20 risk factors were from the psychiatric/psychological category, including the three with the highest pooled odds ratios. There are many reasons why AYAs may engage in self-harm including using it as a coping mechanism (Chakraborti et al., 2021); for sensation-seeking (Serafini et al., 2015); to deal with psychological pain (Cheek et al., 2020); or, for emotional regulation during times of intrapersonal difficulties (Taylor et al., 2018).

The design and implementation of programmes to prevent or reduce self-harm (and possibly suicide) in young people by identifying those who exhibit psychiatric or psychological risk factors could be informed by the results in this review. In a systematic review examining suicide prevention interventions for young people, Calear et al. found that a

majority (59%) of effective interventions involved psychotherapeutic treatments such as cognitive behavioural therapy (CBT), dialectical behavioural therapy (DBT), or problem-solving therapy, which have been delivered both on an individual or group level (Calear et al., 2016). Self-harm prevention strategies could be designed by identifying individuals who exhibit psychiatric or psychological risk factors and referring them for appropriate therapies or to the appropriate professional. Such programmes, that span across clinical and non-clinical settings, could be effective in reducing self-harm in the AYA population (Calear et al., 2016).

Childhood (sexual) abuse or neglect was the risk factor that was most frequently found to be associated with self-harm in young people – identified by nine different general systematic reviews (see Fig. 2). Bullying and ALEs (in general) or trauma were ranked joint third along



Fig. 3. Sunburst chart for the highest pooled odds ratios identified for any risk factor for self-harm. Note: any risk factor with a maximum pooled odds ratio of less than 2 is not included here and the pooled odds ratio for the risk factor of previous self-harm/suicide attempt behaviour (31.33 (9.36–104.8) (Miranda-Mendizábal et al., 2019)) is not included.

with other psychiatric illnesses (not depression or anxiety). Furthermore, childhood abuse, bullying and trauma/ALEs had the three highest pooled odds ratios in the ALE category (see Fig. 3). The psychiatric/psychological and ALE risk factor categories are highly related to each other since ALEs, such as physical abuse, sexual abuse, neglect, and witnessing domestic violence during childhood, have a highly adverse

impact on mental health and are associated with internalising and externalizing symptoms and thus are risk factors for self-harm and suicide attempts (Zatti et al., 2017). Altogether, it is important for professionals who work with young people to refer those young people to mental health services if they have disclosed experience of these risk factors, and especially if they also exhibit problems with their mental

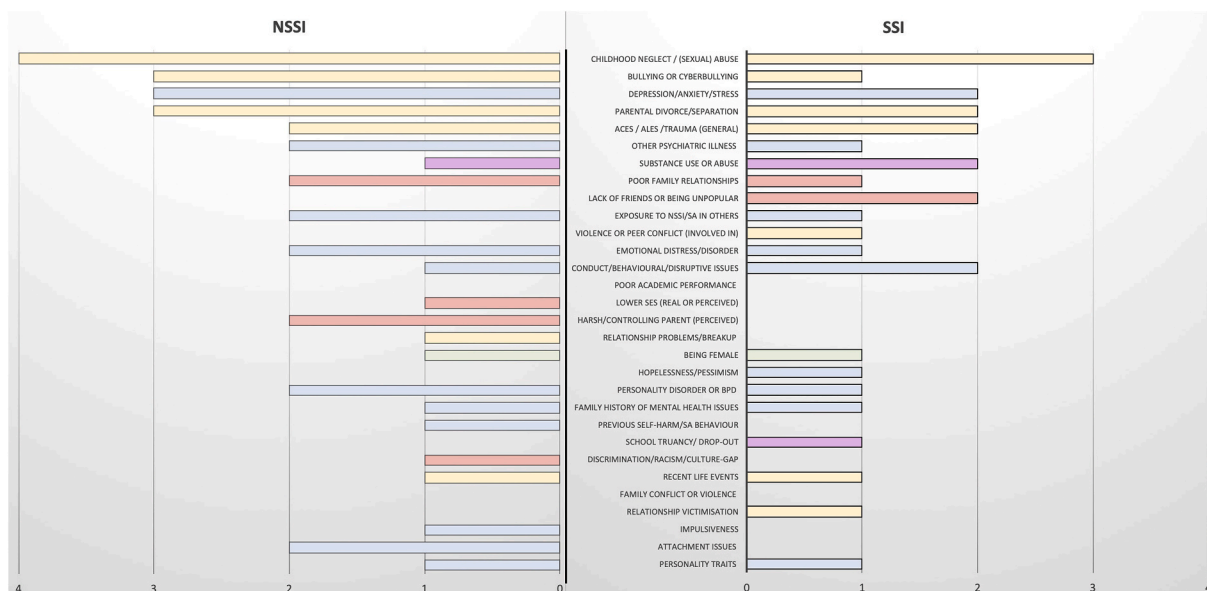


Fig. 4. The numbers of times each risk factor was identified as being associated with NSSI or SSI by the general reviews.



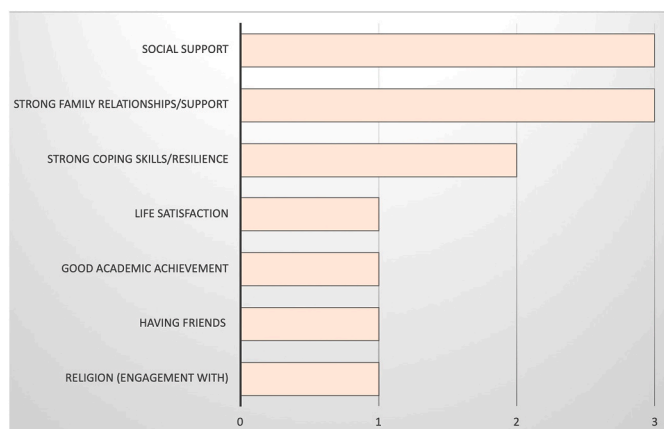


Fig. 5. The numbers of times each protective factor was identified as being associated with self-harm by the general reviews.

health.

The school/college setting is important to consider in the context of self-harm and suicidal behaviour in AYAs. Many of the risk factors for self-harm concerned school, college, or social-life: bullying; peer conflict/violence; exposure to self-harm in others; being unpopular or isolated; conduct or behavioural issues; poor grades; and, school truancy or drop-out. All of these may offer professionals who work with young people with opportunities to intervene at earlier time points in order to prevent self-harm or suicidal behaviour in AYAs. Anti-bullying strategies in schools may be particularly helpful in reducing mental health problems and potentially self-harm in adolescents (Fraguas et al., 2021). Young people with poor reading abilities have been found to have higher suicidal ideation and attempts (Daniel et al., 2006). Interventions for young people or students having difficulty in school or college (academic or otherwise), or indeed for young people that have dropped out of education, may be particularly important in order to reduce the burden of self-harm and suicide, and indeed general mental health problems, in AYAs.

There is evidence that school-based interventions aimed at reducing self-harm and suicide in young people can be particularly effective (Calear et al., 2016; Morken et al., 2020). Multifaceted approaches (universal or targeted) for reducing self-harm in young people, involving a myriad of professionals (such as doctors, nurses, social workers, therapists, psychologists, and teachers etc.) should be considered, designed and informed by the results of this study (Calear et al., 2016). The use of multidisciplinary teams in clinical, school and community settings could be utilised to identify young people with psychiatric presentations, trauma related life events or problems in schools. These young people should be referred for appropriate treatment or should be given adequate support by such teams of professionals.

Outside of the psychiatric/psychological and ALE categories, substance use or abuse of tobacco, cannabis, alcohol and illicit drugs was also found to be strongly associated with self-harm in AYAs. It was the most frequently identified risk factor from the behavioural category in Fig. 2 ranked list. A growing body of research suggests that health risk behaviours often do not occur in isolation – smoking, drinking, illicit drug use, sexual risk taking, and aggression (and, indeed, self-harm and suicidal behaviour) are all associated with increases with each other (Bozzini et al., 2021). Suicidal behaviour has been described as the “ultimate health jeopardising behaviour” (O’Connor, 2021). This may be one such behaviour among a whole suite of behaviours (substance use and abuse included) that young people use to manage emotions during both internal biological and external life event change. The implementation of cessation strategies should be considered by professionals who encounter AYAs engaging in substance use (in clinics, schools or in the community) along with interventions and referral procedures for

those simultaneously suffering from mental health problems.

Parental divorce or separation, having poor family relationships, or being in child placement or foster care services have all been identified as important risk factors. In addition, from the few studies that did review protective factors, we concluded that having good social, family and friend supports appeared to be significant. Social workers, teachers, clinicians and other professionals should be cognisant of this whilst working with young people across community, school and clinical settings. Self-harm prevention or general mental health strategies across these different settings should be informed by these related factors. Furthermore, being lesbian, gay or bisexual (LGB) was also an important risk factor since peer or friend relationships for LGB young people may be more problematic due to stigmatisation or family rejection (Medina-Martínez et al., 2021). Interventions could be designed and implemented that involve sex education, sexual and gender diversity, bullying, and self-harm prevention as well as promoting family-centred care (Medina-Martínez et al., 2021).

#### 4.1. Further research

The majority of included systematic reviews examined risk factors for self-harm in AYAs; whereas, a small minority examined protective factors. Only five (Abdelraheem et al., 2019; Aggarwal et al., 2017; Cipriano et al., 2017; Rojas-Velasquez et al., 2020; Valencia-Agudo et al., 2018) of the included 12 general systematic reviews identified protective factors and only two of the factor-specific reviews reported pORs for protective factors (Chiu et al., 2018; Marraccini and Brier, 2017). Further primary studies and systematic reviews should be carried out on protective factors for self-harm since these could be used to inform prevention strategies in the future. Moreover, there are many risk factors that have been identified by general reviews (e.g. smoking or poor family relationships) but have not had a meta-analysis conducted to examine the strength of its association. Indeed, the majority of risk factors in Table 5 did not have meta-analyses conducted to measure the strength of their association with self-harm in AYAs. These are meta-analyses that should be conducted in the future.

In addition, systematic reviews and meta-analyses are also needed for some risk factors that may have not been identified by studies in this review. For example, while there was evidence from a meta-analysis by Batejan et al. that being LGB was associated with self-harm in young people (Batejan et al., 2015), there was no review included in this study that examined being trans youths, a group which has been shown to have higher rates of self-harm compared to cis-gendered young people (Butler et al., 2019; Medina-Martínez et al., 2021).

Researchers should also consider stratifying their pORs by sex, where possible. Miranda-Mendizábal et al. study conducted meta-analyses comparing and males and females (Miranda-Mendizábal et al., 2019). This study found that dating violence was a risk factor for suicide attempts in females but not in males; whereas, it found that parental separation was significantly associated with suicide attempts in males but not in females. Furthermore, it may also be useful for meta-analyses to be stratified for different age groups within the AYA cohort.

Another area that needs further research is the interplay between all the different risk and protective factors for self-harm in AYAs. All of the risk/protective factors listed in Table 5 are individually associated with self-harm in AYAs. What is not fully understood, however, is the extent to which these factors are associated with each other; which ones are moderators or mediators; which ones lie on the causal pathways to self-harm in AYAs; and, at what points, therefore, can public health workers in the area of mental health intervene effectively.

Only five of the included systematic reviews focused on a particular area or population in this study. The vast majority of included studies focused on an outcome regardless of the geographic region of the primary studies. Therefore, it was not in the scope of this study to examine regional variations of risk or protective factors. Since self-harm is often a culturally determined phenomenon, the examination of the variations of

risk or protective factors for self-harm in AYAs is an area that merits further research.

#### 4.2. Limitations

We did not examine any of the primary studies and our results largely depend upon the rigour and methods of the systematic reviews. We did, however, conduct a quality assessment using the AMSTAR-2 checklist (Shea et al., 2017). In addition, the present umbrella review had to deal with many systematic reviews that did not conduct meta-analyses; thus, a lot of the results for risk and protective factors were based on the frequency in which these factors were identified by systematic reviews.

Disentangling NSSI and SSI or suicide attempts can be a difficult endeavour and we were not always able to do so. Some of the studies did specify NSSI or SSI as an outcome; whereas others used term self-harm, meaning both. This was a challenge but we did report on the two different outcomes in any paper where it was possible to differentiate the two.

We used the AYA cohort since this was used for the majority of studies in this review. Within these studies, there was minimal stratification for the different age groups within AYAs (e.g. young teenagers compared to young adults). Having said that, this is a results in itself from this umbrella review and, as noted before, meta-analyses should be stratified for different age groups within the AYA cohort.

Finally, our conclusions regarding protective factors were immensely limited by the dearth of systematic reviews that reported on protective factors, mostly likely owing to the fact that the primary studies themselves tended not to examine protective factors to the same extent as risk factors. Hence, any conclusions regarding protective factors from this review should be interpreted with caution.

#### 5. Conclusion

This umbrella review of systematic reviews provides robust evidence for the principal risk factors for self-harm in AYAs, which itself is an important risk factor for suicide – one of the leading causes of death globally in young people (World Health Organization, 2021). Clinicians and other professionals who work with young people should be particularly cognisant of the psychiatric and ALE risk factors as well as the substance use, education-related and individual-level (e.g. being LGB) risk factors for self-harm. Procedures should be put in place in different settings to refer young people for adequate care when a professional recognises these risk factors in a young person. Knowledge of risk and protective factors for self-harm should be used to inform the design and implementation of public health measures to reduce self-harm in young people. Further research is needed on protective factors for self-harm and how the various risk/protective factors are related to each other. Moreover, in future research, meta-analyses should be stratified for both gender and different age groups within the AYA cohort.

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#### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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#### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jpsychires.2023.10.017>.

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