

# **Research on Non-suicidal Self-Injury in Adolescents**

Literature review

Lääketieteellinen tiedekunta  
Nuorisopsykiatria  
Syventävien opintojen kirjallinen työ

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The purpose for this literature review is to examine the state of research on possible trend changes regarding non-suicidal self-injury (NSSI) among 13–18-year-old adolescents within community-based populations. Non-suicidal self-injury (NSSI) is defined as deliberate, self-inflicted harm to one's own body without the intent of suicide and has been identified as a separate phenomenon from other forms of self-injurious behaviors, such as suicidal ideation, attempts, or deaths.

Articles for this literature review were collected from three databases (Pubmed, Embase, PsycInfo) alongside with a later manual search and overlook of references from the selected articles. The search focused on population-based time-trend studies of NSSI in adolescents in which data were collected through anonymous self-reporting questionnaires. Out of 1,002 originally found articles only one met all priorly established criteria and was chosen to be the leading article for this review. Additionally, three previously excluded articles with the greatest potential of presenting findings on trend changes in NSSI and overall mental health in adolescents were chosen to act as supporting articles.

According to current literature, the lifetime prevalence of NSSI and its association with suicidality have remained relatively stable over time, although a slight increase of NSSI was observed during the global COVID19-pandemic, especially among the female population. The near absence of studies examining trend changes solely on NSSI outside of a pandemic leaves its current trajectory largely unknown. Despite some controversy regarding trends, the reviewed literature consistently identifies NSSI as a significant health concern highlighting the need for its early preventive interventions.

**Keywords:** Non-suicidal Self-injury, Adolescents, Time-trend change studies

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# 1 Introduction

## 1.1 Background and Context

Non-suicidal self-injury (NSSI) is defined as deliberate, self-inflicted harm to one's own body without the intent of suicide. It is distinct from other forms of self-injurious behaviors that may involve suicidal ideation, attempts, or deaths. NSSI can occur simultaneously with suicidal behaviors within a specific timeframe or in different chronological patterns in the same individual (Käypä hoito - suositus, 2022; Nock et al., 2010). NSSI often presents as cutting, burning, or hitting oneself, with clinical manifestations such as bleeding wounds, burn marks, and bruises (Kerr et al., 2010; Oppiportti, 2023). It frequently occurs in the context of various psychiatric disorders, including borderline personality disorder, posttraumatic stress disorder, depression, eating disorders, and substance use disorders, though not all individuals engaging in NSSI have these conditions (Riala, 2022).

NSSI is prevalent especially among adolescents and young adults, presenting itself as a significant concern regarding the wellbeing of youth. Supporting this concern, a meta-analysis of population-based studies between 1990-2015, where multiple different data gathering methods were used across different studies, data (self-report questionnaires in 158 datasets, parent-report in 2 and interviews in 11) revealed an overall lifetime prevalence of deliberate self-harm at 16.9%, with increasing rates until 2015; cutting had been reported as the most common form, accounting for 45% of cases (Gillies et al., 2018). In Finland, the prevalence of NSSI among adolescents is estimated to be between 10-20%, peaking at ages 16-17 (Oppiportti, 2023).

In addition to different mental health illnesses, such as depression, substance abuse problems and previous suicide attempts, deliberate self-harm even without any intention for death is considered as a major risk factor regarding future suicide attempts and suicides (Käypä hoito - suositus, 2022). Studies have also shown that repetitive NSSI seems to be at high risk to, for example, continued dysfunctional emotion regulation strategies and increased risk for substance misuse, even after cessation of NSSI (Brown and Plener, 2017). Due to NSSI's influence and future complications individually, we have a great need to understand, prevent and treat it with firmness.

## 1.2 Terminology

Understanding NSSI is complicated by the lack of a universally accepted terminology and classification system. For instance, in the United States, the term "non-suicidal self-injury (NSSI)" is commonly used, while in the United Kingdom and other countries using the ICD classification system

(The International Classification of Diseases), “deliberate self-harm (DSH)” is the preferred term, which includes both non-suicidal and suicidal self-harm (Hawton et al., 2012). The American Psychiatric Association has established diagnostic criteria for both suicidal self-injurious behavior disorder and non-suicidal self-injury (*Diagnostic and statistical manual of mental disorders*, 2013). In this review, the term “NSSI” will be used exclusively, referring only to non-suicidal self-injury and not to other related terms including other suicidal behaviors such as DSH.

### **1.3 ROSA**

This review is part of the ROSA-project serving a purpose of finding current literature and results on time-trend studies of NSSI that can be comparable to ROSAs’ gathered data and outcomes.

ROSA is an ongoing study conducted in all 7<sup>th</sup>, 8<sup>th</sup> and 9<sup>th</sup> grades in comprehensive schools in Salo and Rovaniemi, Finland, focusing on the well-being of young people and potential issues they face. The aim of the study is to explore questions related to youth behavior, emotional life, bullying and school satisfaction, as well as to compare the emotional and psychosocial situation of adolescents across the 25 years during which data has been collected, specifically on years 1998, 2008, 2014, 2018 and 2023. The results of the study are intended to support the planning of school and healthcare services targeted at youth. The research data has been collected through anonymous self-reported questionnaires. The research results will be published as scientific articles, and a summary of these articles will later be provided to the participating schools. The ROSA-study has included NSSI as one of their questions throughout all of the years of the study.

### **1.4 Literature review**

This literature review focuses specifically on population-based time-trend studies of NSSI in adolescents where data has been collected through anonymous self-reporting questionnaires, aiming to understand changes over time in, for example, prevalence, possible risk factors, and outcomes rather than presenting statistics from a single period or location. Time-trend studies essentially refer to studies that track secular changes over calendar time in outcomes at the population level. This allows us to assess how prevalence or incidence shifts across different time periods (Keyes and Platt, 2024). Comparable data is thus collected over multiple time points among similar-aged populations within the same geographical area, and can show possible changes in the assessed phenomena over time. Population-based studies investigate a group of individuals taken from the general population who share some common characteristic. In our interest, the common characteristic is the participants’ age range. This approach provides the opportunity to answer specific questions for defined populations, such as adolescents in the community who are not in psychiatric-in-patients at the time of the study.

These studies are essential for identifying genuine changes in mental health trends and can guide public health planning and interventions (Collishaw, 2015).

## **1.5 Research gap**

Despite the growing body of research on self-injurious behaviors, studies solely focusing on the trend of NSSI are relatively rare and often overlap with broader investigations into suicidal behaviors. Most existing studies on NSSI gather data through self-reporting questionnaires, but are longitudinal in nature, examining specific predisposing factors such as school experiences, sleep problems, or comorbid psychiatric conditions like depression (Kidger et al., 2015; Tuisku et al., 2014; Zheng et al., 2023). Notably, there is a significant lack of comprehensive, synthesized evidence on NSSI, particularly regarding time trend analyses, especially compared to the number of well-documented studies in adolescent suicide rates (Chang et al., 2023; Kyung et al., 2021). This review aims to address this gap by exploring how NSSI prevalence and risk factors have evolved, highlighting the need for focused research on NSSI as a distinct phenomenon.

## **1.6 The objective of the review**

The aim of this literature review is to provide a comprehensive overlook of current understanding of changes in time regarding non-suicidal self-injury (NSSI) in adolescents as reported through anonymous self-reported questionnaires. Alongside with this, this review will discuss and point out implications for future research and clinical practice based on current findings.

## 2 Methodology

### 2.1 Search strategy

A comprehensive literature search was conducted in January 2024. The search terms and statement were decided together with the supervisors and approved by an informatician from the Turku University library. The following specific words and their synonyms were used as search terms: adolescent, self-injurious behavior, time-trend study and self-report.

As an example, the complete used search statement for PubMed database was:

- i) ((adolesc\* OR "Adolescent"[Mesh] OR youth OR teen\*) AND ("Self-Injurious Behavior"[Mesh] OR self-harm\* OR parasuicid\* OR self-injur\* OR self-cut\* OR self-destruct\*) AND ("Longitudinal Studies" [Mesh] OR longitudinal\* OR "long term" OR long-term OR time-trend\* OR "time trend\*" OR "change" OR "repeated") AND ("Self Report"[Mesh] OR "self report\*" OR self-report\*) AND (survey OR questionnaire OR interview))

See the Appendix for all search statements used.

### 2.2 Eligibility criteria

Inclusion and exclusion criteria of the studied were as follows:

1. Inclusion criteria included:
  - i) participants attending 7<sup>th</sup>, 8<sup>th</sup>, or 9<sup>th</sup> grade in comprehensive school, ages then being estimated between 13 to 18 (with the allowance of a few individuals exceeding the age-range if they were enrolled in these grades regardless of age)
  - ii) gathering of the research data was through a self-reporting questionnaire
  - iii) study's main or partial focus being on NSSI
  - iv) the sample is formed from general population and participants were not residing in a care institution at the time of answering the questionnaire
  - v) study is a time-trend study of cross-sectional data with minimum of two studied timepoints
  - vi) study has been published in a scientific peer-reviewed journal
2. Exclusion criteria were:
  - i) Language being anything else other than English or Finnish

### 2.3 Data collection

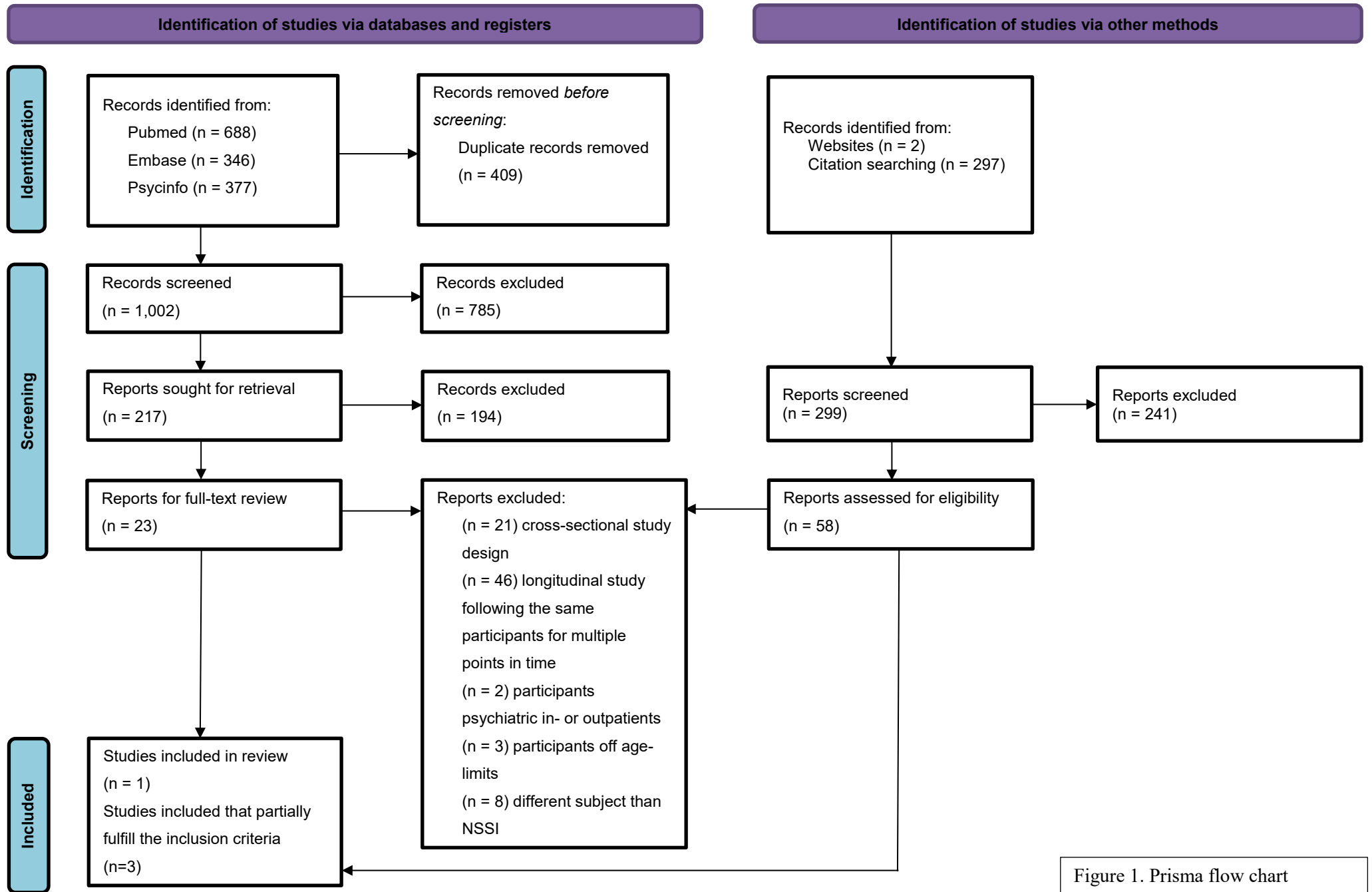
Data for this review was collected from three separate databases, being Pubmed, Embase and PsycInfo, alongside with a later manual search and an overlook of references from the selected studies. All articles from the said databases were initially imported into Zotero, where duplicates were identified and removed.

## **2.4 Data analysis**

Upon full-text review of the included studies the following information was gathered into an excel from each of the articles: title, authors, publication year, journal where published, population being studied, the number of participants, timeframe for the study, the number of time points within the course of the study, informants if other than participants themselves, other possible phenomena joined together with NSSI and main results of the study. A standardized data extraction form, in Excel-format, was used for consistency of the collected information. Simplified form of included studies' characteristics is presented later as Table 1.

## **2.5 Use of AI**

Within the writing process Artificial Intelligence (AI) was used to correct English grammar. All text outside of direct quotes was produced by the author with the help of supervisors.



## **3 Results**

### **3.1 Study selection**

The initial search yielded a total of 1,411 articles across these mentioned databases: 688 from Pubmed, 346 from Embase and 377 from PsycInfo. After eliminating duplicates, 1,022 unique articles remained. After title and abstract screening, and full-text reviews, none of the articles met all eligibility criteria (see figure 1 for more extended report for study selection).

Through further manual search and with the assistance of the supervisors, a newly published article was identified that met all inclusion criteria, which was then included as the leading article for this literature review. In addition, three articles were taken into the writing process due to partially meeting inclusion criteria and showing most potential within them comparing to the other excluded articles. One of these studies also being a literature review, another being a meta-analysis and the third being an analysis of repeated cross-sectional national health surveys. All of the references within the included articles were assessed, but non met all of the inclusion criteria for this review.

### **3.2 Description of the included studies**

For study characteristics of the included articles, see Table 1 below.

Only one article was chosen to be fully included in the literature review. This chosen article “Mental health after the COVID-19 pandemic among Finnish youth: a repeated, cross-sectional, population-based study” by Olli Kiviruusu and others was published in *Lancet Psychiatry* in June 2024. The purpose for this study was to examine in which direction the heightened levels of adolescent mental health problems have developed after the pandemic. This was done by assessing different mental health problems among Finnish youth before, during and after the COVID-19 pandemic using nationwide population-based samples (Kiviruusu et al., 2024).

In addition to our leading article, there were three articles that didn't meet all of our inclusion criteria, one being a literature review, one a meta-analysis instead of an individual time trend study, and the third being a retrospective secondary analysis of data of overall mental health changes with an age range of 4-24. Despite their study designs, each provided useful data or conclusions to their studies on overall mental health status of adolescents, for what reason some of their main thoughts and findings are also presented and used as commentary points together with the leading article.

From these three supporting articles two gathered data globally and one study was conducted within the UK region. One of these global studies was done by Brown and Plener about Non-suicidal Self-Injury in Adolescence. As a literature review, it synthesized existing literature on the epidemiology, etiology, and therapeutic approaches to NSSI, drawing primarily on findings from self-report questionnaires. The study was published in *Current Psychiatry Reports* in 2017 and had references to 79 articles (Brown and Plener, 2017). Another global meta-analysis done by Lim et al.'s estimated prevalence rates of suicidal behavior and NSSI worldwide, based on studies that predominantly employed school- and community-based self-report surveys. Data for this study was collected between 1989 and 2018 from 99 different studies and the meta-analysis was published in the *International Journal of Environmental Research and Public Health* in 2019 (Lim et al., 2019). Complementing these, Pitchforth et al.'s conducted a study in the UK region, where they analyzed repeated national health surveys to examine changes in mental health outcomes, including deliberate self-harm, amid rising service demand, using standardized self-report questionnaires and parent-reports for younger participants. This study was published in *Psychological Medicine* in 2018 (Pitchforth et al., 2019). (Table 1)

In the included study conducted in Finland, data was collected from rounds of the School Health Promotion (SHP) study in Finland conducted between 2015 and 2023 (Kiviruusu et al., 2024). Participants included students in the eighth and ninth grades of comprehensive school, and first-year and second-year students in general and vocational upper secondary school, comprising a total of 722 488 participants with a mean age of 15.8 years, oldest participant being 20 years old. Descriptive data of the participants included official gender, gender identity, school level, grade level, parental education, family origin, family financial status and region of Finland.

The SHP study includes the following topics: anxiety (the generalized anxiety disorder scale), depression (the patient health questionnaire), social anxiety (the mini social phobia inventory), overall mental wellbeing (the short Warwick-Edinburgh mental wellbeing scale), loneliness, disordered eating (the sick, control, one, fat, food measure), and suicidality separated into suicidal ideation, deliberate self-harm and suicide attempts.

Deliberate self-harm was assessed by adding its questions alongside with lifetime suicidal ideation and suicide attempts, which were measured by using the European School Survey Project on Alcohol and Other Drugs. Participants answer options to a claim of deliberate self-harm at least five times were yes or no, which were then analyzed.

Table 1. Study characteristics of included articles

First writer (publication year)	Study design	Journal	Country	Data collection years	Number of participants	Age range of participants	Informants	Connected phenomena to NSSI
Olli Kiviruusu (2024)	Repeated cross-sectional, population-based	Lancet psychiatry	Finland	2013-2021	754 128	approx. 14-18	participants (adolescents)	COVID-19
Rebecca Brown (2017)	Selective literature review	Curr Psychiatry Rep	Global	approx. 2000- 2016	not reported	10-21	participants (including adolescents), some parent/clinician reports	Emotional dysregulation, mental health problems
Kim-San Lim (2019)	Meta-analysis of observational studies	Int J Environ Res Public Health	Global	1989-2018	686 672	10-24	participants (including adolescents), some parent/clinician reports	Association to suicidal behavior
Jaqueline Pitchforth (2018)	Repeated cross-sectional national health surveys	Psychol Medicine	United Kingdom	1995-2014, inclusive of 36 separate surveys	140 830	4-24 (divided into 4-12, 13- 15, 16-24)	participants (including adolescents)	Rising internalizing symptoms (depression/anxiety)

### 3.3 Results and prevalence regarding NSSI

#### 3.3.1 Prevalence rates

Across the reviewed studies, overall prevalence rates of non-suicidal self-injury, alongside with suicidal ideation and suicide attempts that were included within the studies, varied considerably. Focusing on NSSI, one international review reported lifetime prevalence of NSSI to be between 17-18% in community samples, while their estimates reached up to 60% in adolescent psychiatric populations (Brown and Plener, 2017). Another article, drawing data that had been collected from 1989 to 2018, calculated the global aggregate lifetime prevalence of NSSI at 22.1% (95% CI: 16.9-28.4%) and the 12-month prevalence at 19.5% (95% CI: 13.3-27.6%) respectively. When deliberate self-harm was defined more broadly with the meaning of an encompassing term for self-injurious behavior, both with and without suicidal intent that has a non-fatal outcome, the corresponding aggregate estimates were 13.7% (95% CI:11.0-17.0%) and 14.2% (95% CI: 10.1-19.5%) for 12-month prevalence (Lim et al., 2019).

#### 3.3.2 Trend changes

Broader evidence from population-based surveys of mental health provided both supporting and controversial findings to changing trends on overall mental health conditions. A repeated cross-sectional national health survey on mental health and well-being among children and young people ages 4-24 conducted in the United Kingdom between years 1995-2014, didn't study NSSI alone, but reported increases in long-standing mental health conditions across all participants in England (0.8-4.8% over 19 years), Scotland (2.3-6.0%, over 11 years) and Wales (2.6-4.1%, over 7 years) (all  $p < 0.001$ ) thus supporting the possibility of increasing trend on NSSI. Yet, their findings on psychological distress were less consistent. Among 13-15-year-olds, the proportion with high SDQ-E scores (Strengths and Difficulties Questionnaire Emotional) decreased in England (OR 0.98 (0.96-0.99),  $p=0.006$ ) but increased in Wales (OR 1.07 (1.03-1.10),  $p < 0.001$ ). Overall, the survey found no evidence of consistent rise in psychological distress among children and adolescents (Pitchforth et al., 2019).

Results from the study by Kiviruusu et al. indicated that the prevalence of deliberate self-harm, lifetime suicidal ideation, and suicide attempts increased significantly among girls but not among boys (Kiviruusu et al., 2024), suggesting an increasing, gender-specific, trend in NSSI.

### 3.3.3 Gender specific changes

When taken gender differences into an account, controversial findings were again present. In the leading article gender differences in deliberate self-harm among the female population were statistically significant in higher secondary education (interaction  $p < 0.0083$ ), while differences in suicidal ideation and suicide attempts were significant in lower secondary education. In contrast, similar increase of NSSI among the male population was not evident. Girls also reported overall mental health symptoms more frequently than boys thus reinforcing the interpretation of an increasing trend of NSSI and other mental health issues perhaps concerning mainly girls rather than both boys and girls (Kiviruusu et al., 2024).

Controversial to these findings, one study found no significant difference trends of overall mental health issues between males and females (Pitchforth et al., 2019). Another study presented that although female adolescents were more likely to engage in NSSI than males, the prevalence rates of NSSI have rather stayed stable across publications from different countries at least between the years of 2000-2015, thus not being able to prove an increasing or decreasing trend among either female or male population (Brown and Plener, 2017).

### 3.3.4 Age specific changes

Even though no evidence on consistent rise in psychological distress was detected, one study suggested that the few founded evidence in recent years (since 2011) of worsening trends in psychological distress and well-being primarily concerned the group of young adults (16-24) rather than children and adolescents (Pitchforth et al., 2019).

## 3.4 Affecting risk-factors

Although research specifically addressing trends in NSSI remains limited, studies on its epidemiology, etiology and therapeutic approaches are more common. Identified risk factors from the supporting studies include adolescent age, female gender, social or media exposure to NSSI, bullying, and adverse childhood experiences, with emotional abuse showing the strongest association (Brown and Plener, 2017). Complementing these findings, another study examining school-attending populations highlighted academic stress, bullying, and peer victimization as significant contributors to suicidal and self-harm behaviors, with older adolescents being particularly vulnerable due to interpersonal difficulties, psychiatric disorders, and STD-related risks (Lim et al., 2019).

### **3.5 Other phenomena**

As one of their most striking observations with the state of mental health was the high levels of symptoms reported by adolescent girls, where more than 70% reported at least one mental health problem and more than 45% comorbid mental health problems (Kiviruusu et al., 2024). Another study found that repeated engaging in NSSI throughout adolescence was found to elevate further risk for e.g., long-term mental health issues, suicidality, and engaging in risk-taking behaviors (Brown and Plener, 2017). One Australian longitudinal study was able to show that self-harming behaviors (including suicidal behaviors) significantly decrease from adolescence (around 15 years of age) to young adulthood (around 29 years of age) (Brown and Plener, 2017).

## 4 Discussions

### 4.1 Current state of knowledge

#### 4.1.1 Recent research findings

In our interest the difficulty of finding more than one study regarding the trend of NSSI, speaks for itself how poorly this subject alone has been studied, particularly in large populations and over extended periods. Among available research, our leading article stands out as the only one utilizing randomized, anonymous self-reporting data, thus making it uniquely suited to identify trend changes and generalize findings to the wider population. Furthermore, a significant lack of studies also appears to be regarding etiology and treatment of NSSI in adolescence, as emphasized by the same article (Kiviruusu et al., 2024).

As mentioned, previous studies have identified multiple risk factors for NSSI, and Kiviruusu et al. took the following subjects of, global pandemic, increased awareness of mental health, changed reference points to what constitutes as a mental health problem, increased screen time and increased use of social media, into consideration as contemporary influencing factors to their research findings(Kiviruusu et al., 2024). Further longitudinal research could help confirm these risk factors and uncover new ones, particularly those linked to global crises such as the COVID-19. Understanding how crisis-related stressors affected NSSI could also improve the applicability of pandemic-era findings to both normal and future crisis contexts.

During the COVID-19 pandemic, a significant increase in overall mental health issues, including NSSI, especially among girls during the pandemic was detected (Kiviruusu et al., 2024). Although general mental health issues such as anxiety, depression, and social anxiety increased across studies, the limited number of NSSI-specific investigations prevents accurate estimation of the true increase in self-harm behaviors. Gender remains a major risk factor, with adolescent females showing higher rates of NSSI and related mental health problems during the pandemic, raising concern for this particularly vulnerable group.

Evidence from longitudinal studies suggest that while NSSI tends to decrease as adolescents transition into adulthood, those with a history of NSSI remain at elevated risk for later mental health difficulties (Brown and Plener, 2017). This implies that although NSSI behaviors may diminish over time, their psychological consequences persist. Addressing NSSI during adolescence is therefore crucial for preventing long-term mental health complications.

The leading article also raises a question about how much of the observed increase in NSSI and related symptoms can be attributed specifically to the COVID-19 pandemic and whether these trends persist in the area as applicable and true to adolescents after and without a world-changing international pandemic (Kiviruusu et al., 2024). According to previous studies on COVID-19 and its impact on overall mental health conducted during the pandemic, COVID-19 was found to have a clear negative impact on adolescent mental health, with stressors from social distancing and other pandemic-related changes contributing to increased anxiety and depression. Risk factors to this negative impact included poor coping skills, low social support, and increased engagement in addictive behaviors, such as smartphone, internet, alcohol, and cannabis use. Conversely, adolescents with access to positive coping strategies and strong support demonstrated greater resilience and better mental health outcomes during this period (Jones et al., 2021).

Despite the widespread negative impact of COVID-19, some indications of post-pandemic improvement in youth mental health have emerged (Kiviruusu et al., 2024), though the long-term trajectory of NSSI and related behaviors remain unclear. Given that NSSI, suicidal ideation and deliberate self-harm are among the most prevalent self-injurious and suicidal behaviors in adolescents (Lim et al., 2019), our reactivity and better understanding of these symptoms and their trends could help us navigate the appropriate means to treat and furthermore prevent them.

## **4.2 Evaluation**

### **4.2.1 Strengths and limitations**

Methodological limitations of this review included the small number of articles and the lack of quality assessment. As to the weaknesses of our leading article deliberate self-harm was studied only through given data from years 2021 and 2023, which is a relatively short period of time. The study was also conducted during a global pandemic for what reason we only know the trend of NSSI after a global crisis such as a pandemic instead of throughout decades with multiple variables and changes around the world (Kiviruusu et al., 2024).

As to the strengths, even within only two years of data, our leading article had well over half a million participants, sample size large enough to be able to draw trustworthy conclusions on their results as a representation on Finnish youth generally, comparing to the fact that in December 2024 there were around 600 000 Finnish youth in total from ages 10 to 19 (Tilastokeskus, 2024).

The use of anonymous self-reporting questionnaires in a population-based study design was also seen as a strength ensuring the generalization to the whole adolescent community more applicable with

consecutive honest answers to yes-or-no type questions. Both sample size and study design together created the perfect setting to understand general phenomena with as little error as possible.

## **5 Conclusions**

### **5.1 Summary of findings**

Research on population-based time-trend studies of NSSI are to this day scarce, highlighting the importance and great need for future more expanding work in this field.

Throughout the field of study regarding NSSI among adolescents, its' lifetime prevalence and association to suicidality has stayed approximately the same with a slight increase during a global pandemic. There is little to no studies solely on NSSI and its' trend change across long periods in time for what reason the trend of NSSI of our day outside of a pandemic thus still remains unknown. Based on findings during COVID19 pandemic, this crisis appears to be having a detrimental long-term effect on the mental health of adolescents.

### **5.2 Implications for future research**

#### **5.2.1 Research opportunities**

The trend of NSSI is yet to be studied outside of a global pandemic, which would require further continuation of a population-based time trend study through longer periods of time. In addition to investigating potential trend changes in NSSI, there remains a significant gap in understanding the factors contributing to its increase outside the context of global pandemics. Future research could address this gap by incorporating measures of overall mental and somatic health, family circumstances, and the broader impact of large-scale crises such as COVID-19.

Although a broad influencing factor, such as the COVID-19 pandemic, might appear to exert an overriding effect on the entire adolescent population, it cannot be assumed to be the sole or primary risk factor. Other variables, both dynamic and stable during that period, must also be considered when interpreting its' impact. As an example, the pandemic did also raise multiple social media operators to a higher standing than before thus increasing adolescents' knowledge of peer's NSSI culture, for what reason the pandemic, its' social distancing and restrictions, can't be held as the only definite explaining factor to the increase of NSSI over that studied time period.

Our leading study identified an increase in NSSI among adolescent girls during the pandemic. An important question is whether this upward trend will continue at the same rate once the pandemic has ended. Such a development could either indicate a sustained rise in NSSI specifically among girls or suggest that their mental health was more adversely affected by factors, such as social distancing,

compared to boys of the same age group. This question could also be resolved by further ongoing time trend study of NSSI.

Another research question could be regarding NSSI trend increase within adolescence turning into decrease after entering young adulthood, when specifically young adults' overall mental health seems to worsen at the same age group change. The connection between the two could indicate even more urgent need to understand whether an increase in the trend of NSSI is resulting in complications within overall mental health in young adults even when NSSI would mostly stay in adolescence.

### 5.2.2 Practical applications

The findings of the leading article and other reviewed studies even with controversial findings on the trend of NSSI within adolescence all seem to agree it to still be a significant health concern especially among the female population in adolescence. Practically, this highlights the need to invest in understanding and treating mental health symptoms, including NSSI, possibly from early adolescence in preventable ways.

This need could be met by earlier and somewhat regular screening on NSSI starting from basic levels of primary health care, such as in schools and health centers. In addition to this, open and more accessible guidelines for parents for noticing early symptoms of NSSI and what to do when facing such situations could help in overall early screening for this matter. Better screening would enable earlier interventions on NSSI thus preventing its' chronicity and possible development into further suicidal behaviors and mental health issues.

### 5.3 Overall implications

The nature of NSSI has been the same throughout different studies, cutting being the number one mean to deliberately harm oneself. We thus seem to understand the nature of NSSI but still lack in knowledge of understanding its' reasons and how to address the high numbers of prevalence and potentially prevent its' increase among youth in general but also its' further influence to future mental health affects in the future. Understanding its' development could help us invest to the most needed prevention actions to improve the youths' need to deliberate harm themselves and mental health in general.

If the trend of NSSI is increasing despite one major and passing global crisis, it could suggest the need for an overall awareness and development of prevention programs for the youth to navigate better routines to understand and manage anxiety in healthy ways outside of NSSI.

If the prevalence of NSSI is increasing only within pandemic like circumstances, it could suggest the need to build better supporting programs of adolescents' mental health during the earliest stages in similar situations, detect them better and have a lower threshold with early intervention in primary care settings.

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PRISMA 2020 flowdiagram source: Page MJ, et al. *BMJ* 2021;372:n71. doi: 10.1136/bmj.n71.

## 7 Appendix

Tietokanta	Hakulause	Päivämäärä
<b>PubMed</b>	((adolesc* OR "Adolescent"[Mesh] OR youth OR teen*) AND ("Self-Injurious Behavior"[Mesh] OR self-harm* OR parasuicid* OR self-injur* OR self-cut* OR self-destruc*) AND ("Longitudinal Studies" [Mesh] OR longitudinal* OR "long term" OR long-term OR time-trend* OR "time trend*" OR "change" OR "repeated" OR "cross-sectional") AND ("Self Report"[Mesh] OR "self report*" OR self-report*) AND (survey OR questionnaire OR interview))	29.1.2024
<b>Embase</b>	(adolesc* OR 'adolescent'/exp OR youth OR 'youth'/exp OR teen*) AND ('self harm*' OR parasuicid* OR 'self injur*' OR 'self cut*' OR 'automutilation'/exp OR 'self-harm'/exp OR 'self-destruct*') AND (longitudinal* OR 'longitudinal studies'/exp OR 'long term' OR 'time trend*' OR 'change' OR 'repeated' OR 'cross-sectional') AND ('self report*' OR 'self report'/exp) AND (survey* OR questionnaire* OR interview* OR 'survey'/exp OR 'questionnaire'/exp OR 'interview'/exp)	29.1.2024
<b>PsycInfo</b>	(adolesc* OR "Adolescent" OR youth OR teen* OR DE "Youth Mental Health") AND ("Self-Injurious Behavior" OR self-harm* OR parasuicid* OR self-injur* OR self-cut* OR DE "Nonsuicidal Self-Injury" OR DE "Self-Destructive Behavior") AND ("Longitudinal Studies" OR longitudinal* OR "long term" OR long-term OR time-trend* OR "time trend*" OR "change" OR "repeated" OR "cross-sectional") AND (survey or questionnaire or interview or study AND ("Self Report" OR "self report*" OR self-report*))	29.1.2024