

# Prevalence and Co-occurrence of Non-Suicidal Self-Injury (NSSI) in Anorexia Nervosa: A Systematic Review

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## Key words

Anorexia Nervosa  
Feeding and Eating Disorders  
Non-Suicidal Self-Injury  
Self-Harm  
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## Abstract

**Objective:** The aim of this study is to estimate the prevalence of Non-Suicidal Self-Injury (NSSI) in individuals with Anorexia Nervosa (AN) and to compare co-occurrence rates between the restricting (AN-R) and binge-purge (AN-BP) diagnostic subtypes.

**Methods:** A literature search, studies selection and data extraction were performed by authors, and data was summarized using a narrative and statistical approach.

**Results:** Fifteen studies met the inclusion criteria and were included in this study. The occurrence of Non-Suicidal Self-Injury in a population of patients with Anorexia Nervosa ranged between 14.1% and 62.9%. Inpatients showed higher comorbidity rates than outpatients (IN: 14.1%-50.3%; OUT: 14.6%-17.9%). Where Odds Ratios could be calculated, with the exception of one study, patients with binge-purging subtype of Anorexia showed a likelihood of having Non-Suicidal Self-Injury between almost two and seven times higher than those who presented the restrictive subtype of Anorexia Nervosa.

**Discussion:** Although this review showed high co-occurrence between Non-Suicidal Self-Injury and Anorexia Nervosa, there is a broad variability among the results retrieved from different studies, due to differences in sampling and in Non-Suicidal Self-Injury assessment tools. Clinical implications of the association between these factors and insights about possible future research are discussed throughout the whole text.

## 1. Introduction

Clinical management of patients with Eating Disorders (ED; American Psychiatric Association - APA, 2013) presents clinicians with various challenges, including: dropout risks, physiological and psychological comorbidity, disorder duration and severity, dysfunctional self-evaluations, negative interpersonal evaluation and self-harm behaviors. Addressing these therapeutic challenges requi-

res an ongoing process of redefinition and negotiation of clinical management, as well as a search for more effective treatment approaches (Fairburn et al., 2003; Sapuppo et al., 2018; Boltri & Sapuppo, 2021; Halls et al., 2023).

These difficulties appear increased also by cognitive, social, and behavioral deficits shown by patients with a diagnosis of ED, and in particular of Anorexia Nervosa (AN), which provides significant consequences for patients' daily life, their work and their therapeutic treatments (Tchantu-

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ria et al., 2013; Cardi et al., 2018; Tchanturia et al., 2019; Li et al., 2021; Boltri & Sapuppo, 2021; Pleplé et al., 2021; Di Lodovico et al., 2023)

The term *self-harm behaviors* encompass a range of socially unacceptable acts employed as coping mechanisms in response to personal problems or subjective distress (Claes & Muehlenkamp, 2014). These behaviors, constituting a set of self-damaging methods, include both direct actions like Non-suicidal Self-Injury (NSSI) and suicide attempts, as well as indirect actions such as specific eating habits, smoking, and excessive alcohol consumption. While suicide attempts and NSSI are recognized as direct forms of self-harm; ED, risk-taking behaviors, and substance abuse can be viewed as indirect forms, as the physical damage becomes apparent only after repeated engagement in these behaviors and it does not represent the main reason for the involvement in such practices. On the other hand, the motivation behind NSSI is to inflict pain or physical harm, creating an immediate visible damage on the body surfaces (Claes & Muehlenkamp, 2014). From a clinical perspective, research highlights that individuals engaging in NSSI show elevated rates of concurrent eating-disordered behavior and other indirect forms of self-harm (Claes & Muehlenkamp, 2014). In a study using a non-clinical community sample, St. Germain and Hooley (2012) found that individuals engaging in NSSI scored significantly higher on self-criticism and showed a greater association with suicidal ideation than those whose primary self-damaging behavior was restriction or purging. Although the non-clinical design limits direct generalization to patient populations, these findings nonetheless suggest that the two presentations should not be treated as functionally equivalent.

From a neurobiological standpoint, several hypotheses have been advanced to account for the high levels of co-occurrence observed between ED and NSSI. Indeed, reward-associated brain circuits and their neurophysiological mechanisms are compromised in both ED and NSSI (Oudijn et al., 2022). O'Hara et al. (2015) postulated a reward-based model of AN, in which the etiopathophysiology of the disorder is reconducted to an increase in reward responsiveness, leading to the formation of anorectic behavior. In such a system, AN-compatible cues become positively associated with reward, whereas food-related healthy cues progressively lose their rewarding properties and become aversive (O'Hara et al., 2015; Lamanna et al., 2019). These abnormalities might be linked to alterations in neurotransmitter systems, including an increased dopamine (DA) function and decreased serotonin (5-HT) function (Frick et al., 2015; Spadini et al., 2021). Similarly, NSSI is

connected with aberrant functioning of the endogenous opioid system, which is involved in pain perception or relief, reduction of negative affect, reward, and motivation (Sher & Stanley, 2008; Bresin & Gordon, 2013). Moreover, the opioid system is known to modulate the DA system, which is also hypothesized to be enlisted in NSSI (Blasco-Fontecilla et al., 2016). Animal models with reduced DA neurons consistently show self-biting behavior when DA-agonist are administered, whereas the administration of DA-antagonist sort a reversing effect (Devine, 2012, 2019). Another neurotransmitter that might be implicated in NSSI is 5-HT (Sher & Stanley, 2008; Cullen et al., 2013). Genetic studies found a positive correlation between polymorphisms in 5-HT transporters and the probability of NSSI, especially when mediated by stress response (Brown et al., 2017). Nonetheless, other investigations did not report a significant relation between NSSI and 5-HT levels (Stanley et al., 2010). According to the neurobiological evidence summarized above, subjects with ED, particularly diagnosed with AN, and NSSI are both characterized by dysregulation of the reward circuitry and the opioid system, thus leading to a clinical common conceptualization (Oudijn et al., 2022). These neurobiological claims rest primarily on theoretical models and narrative reviews: Oudijn et al. (2022) describe their own contribution as 'conceptual hypotheses' in the title of their paper, while O'Hara et al. (2015) present an explicitly speculative framework for AN etiopathology. The characteristics described above are therefore best interpreted as a hypothesis-generating account of possible shared mechanisms rather than as established neurobiological findings. For this reason, understanding the clinical implications of those neurobiological insights requires future empirical work.

Moreover, focusing on NSSI as primary diagnosis, a recent study reported that nearly 30% of patients with NSSI, use other self-destructive behaviors, such as ED symptomatology, as a means of NSSI. The majority of them did not receive a diagnosis of ED, but exhibit higher clinical severity, which includes increased general psychopathology and decreased quality of life. Additionally, these patients display more severe NSSI, such as a greater variety of methods used, stronger urge to self-injure, and more significant intrapersonal functions (Washburn et al., 2023).

The transdiagnostic cognitive-behavioral model proposed by Fairburn, Cooper, and Shafran (2003) and later extended by Dalle Grave et al. (2016) in the context of AN, offers a different type of explanatory account. In this model, beyond the core psychopathology (*i.e.*, overvaluation of eating, weight, and shape), four additional mechanisms may

sustain the disorder in a subset of patients: clinical perfectionism, core low self-esteem, interpersonal difficulties, and mood intolerance. The latter, defined as poor capacity to tolerate negative emotional states, is specifically relevant here. Fairburn et al. (2003) named cutting and burning, alongside binge eating, purging, and compulsive exercise as 'dysfunctional mood modulatory behaviors,' that is, behaviors patients use to rapidly interrupt intolerable affect. This framing places NSSI and certain ED symptoms in the same functional category: not co-occurring disorders in the strict sense, but potentially interchangeable responses to the same emotional problem.

The functional analysis literature on NSSI leads to a convergent conclusion. Nock and Prinstein (2004) developed a four-function model drawing on behavioral theory: NSSI can serve automatic reinforcement (*i.e.*, affect regulation, self-stimulation) or social reinforcement (*i.e.*, obtaining support, influencing others), with each of these operating through either positive or negative reinforcement. Crucially, automatic negative reinforcement (*i.e.*, stopping bad feelings) consistently emerged as the most endorsed function in their clinical sample. Klonsky (2007) then reviewed 18 studies on the functions of NSSI and found that affect regulation was present across all of them and produced the most uniform pattern of results: aversive emotional states preceded self-injury, the behavior reduced them, and this cycle was what patients themselves most often described as their reason for engaging in it. These findings, taken in parallel with the transdiagnostic account above, suggest that NSSI and AN symptoms may in certain patients reflect the same underlying deficit in affect regulation, rather than simply randomly co-occurring.

### 1.1 Comorbidity of ED and NSSI

Regarding the presence of NSSI in patients with Eating Disorders (ED), research indicates that up to 72% of individuals diagnosed with an ED also disclose their engagement in acts of NSSI (Claes et al., 2014). The prevalence appears to be higher among subjects with Bulimia Nervosa (BN; 26-55.2%) or those with Anorexia Nervosa binge/purging subtype (AN-BP; 27.8-68.1%) compared to individuals with Anorexia Nervosa, Restrictive subtype (AN-R; 13.6-42.1%) (Svirko & Hawton, 2007). Additionally, some studies indicate that individuals diagnosed with BN or AN-BP not only exhibit a higher tendency to engage in NSSI compared to those with other forms of ED, but they also demonstrate a greater likelihood of employing multiple methods of NSSI, compared to those with a restrictive form of ED (Muehlenkamp et al., 2011). This observation suggests that purging

behaviors and NSSI show similar characteristics, as both concern intentional and active bodily interventions, unlike more passive behaviors such as caloric restriction (Favaro et al., 2007).

Considering the elevated co-occurrence rates of NSSI and ED and the shared aspect of inflicting physical harm on oneself, if engaging in these behaviors, it appears likely that these disorders might share a common pathogenesis and exhibit overlapping epidemiological and sociocultural features (Svirko & Hawton, 2007). Both conditions have well-documented detrimental effects on bodily functioning and are associated with increased risks of chronicity and mortality (Polskaya et al., 2023), making their co-occurrence a public health concern that is particularly pronounced in adolescents and young adults. There is also evidence that impulsive behaviors such as NSSI reduce engagement with ED treatment (Kirkpatrick et al., 2019), which means that understanding this comorbidity has direct clinical implications beyond simply documenting its prevalence.

The simultaneous involvement in both practices appears to heighten these risks, as it is correlated with an increased probability of suicidal tendencies compared to individuals displaying only one of these disorders (Jacobson & Gould, 2007). This situation appears to be even more threatening in contemporary society, as a notable rise in the prevalence of both ED and NSSI among females aged 13–19 was observed since the onset of the COVID-19 pandemic (Trafford et al., 2023). In particular, the incidence rates for EDs and NSSI were identified to be 42.4% and 32.0% higher than expected, respectively (Trafford et al., 2023).

### 1.2 Current state of the art

Over the past two decades, increasing attention has been devoted to the co-occurrence of ED and NSSI. Early evidence provided by Svirko and Hawton (2007) reported highly variable co-occurrence rates between NSSI and EDs, ranging from 13.6% to 68.1%, although these findings were largely based on samples composed almost exclusively of female inpatients, thus limiting their generalizability (Zelkowitz & Cole, 2018). Subsequently, Cucchi et al. (2016) conducted a systematic review and meta-analysis including inpatient, outpatient, and mixed samples, estimating an overall prevalence of NSSI of approximately 27.3% among individuals with EDs, with higher rates observed in BN compared to AN.

Subsequent meta-analyses have reached consistent conclusions. Sohn et al. (2023), restricting inclusion to studies with control groups, found that individuals with EDs were nearly seven times more likely to report NSSI compared to

healthy controls and also exhibited higher rates of suicidal ideation and suicide attempts. Similarly, Amiri and Khan (2023) reported a prevalence of NSSI of approximately 40% in heterogeneous samples of patients with AN and BN alongside substantial rates of suicidal ideation and prior suicide attempts. The most comprehensive meta-analysis to date, conducted by Kirkpatrick et al. (2023) and including 79 studies and over 32,000 individuals with ED, estimated a pooled prevalence of NSSI of 34.59%, with markedly higher rates in patients with AN-BP subtype compared to the restrictive subtype.

Despite these contributions, several methodological issues limit what can be concluded from the existing literature. A large portion of the included primary studies precedes the publication of the DSM-5, and the operationalization of NSSI varies considerably across them. Most reviews have also treated ED as a single category, without separating the different ED diagnoses.

Focusing specifically on AN is justified given the early onset of the disorder, its severe medical and psychiatric burden, and its profound impact on psychosocial functioning (Van Eeden et al., 2021). Patients with AN also face ongoing challenges in social functioning and work performance (Tchanturia et al., 2019; Li et al., 2021; Pleplé et al., 2021; Di Lodovico et al., 2023). The social impairment symptoms, in turn, appear linked with AN symptoms, such as calorie avoidance and low body mass index (BMI; Cardi et al., 2018; Di Lodovico et al., 2023; Halls et al., 2023). Therefore, the decision to focus specifically on AN, rather than ED more broadly, was driven by clinical and methodological considerations. In fact, it has been highlighted that AN has the greatest fatality rate among all psychiatric disorders with deaths resulting from both medical complications and suicide (Neale & Hudson, 2020; Van Eeden et al., 2021; Polskaya et al., 2023), and engagement in NSSI has been consistently identified as a strong predictor of suicidal behavior (APA, 2013; Zerkowicz & Cole, 2018). Moreover, AN also presents a structural advantage that is unavailable in reviews treating ED as a homogeneous aggregate: the two diagnostic subtypes, AN-R and AN-BP, constitute contrasting clinical presentations within the same diagnosis, making their comparison a controlled within-disorder test of hypotheses about the role of impulsive and binge-purge behaviors in NSSI co-occurrence.

To date, only one systematic review has specifically focused on the association between AN and NSSI. Sesboüé et al. (2025) conducted a systematic scoping review examining the links between these conditions and highlighting their clinical consequences, including increased psychia-

tric comorbidity, elevated suicide risk, and poorer treatment outcomes in patients with co-occurring NSSI. This review is nonetheless subject to the same methodological limitation that affects earlier syntheses on the topic. Specifically, both Sesboüé et al. (2025) and earlier systematic reviews and meta-analyses included primary studies in which ED and NSSI diagnoses were established using heterogeneous diagnostic frameworks, frequently relying on DSM-IV criteria. This aspect is particularly relevant given that NSSI was formally introduced as a diagnostic entity for the first time in the DSM-5, and that this version of the manual also introduced substantial modifications to the diagnostic criteria for AN, namely, the need to be in a condition of amenorrhea in order to receive a diagnosis of AN was abolished (APA, 2013). Consequently, the inclusion of studies based on earlier diagnostic systems may contribute to variability in prevalence estimates and limit the conceptual coherence of existing syntheses. Therefore, limiting the inclusion to DSM-5-based diagnoses addresses this limitation in a more targeted way than has been done in previous reviews.

The goal of this synthesis is therefore to clarify the magnitude of the NSSI-AN association within a methodologically restricted but more homogeneous corpus of studies, and to draw implications for clinical assessment and treatment.

## 2. Materials and Methods

### 2.1 Rationale

The restriction of the present review to AN specifically, rather than to ED more broadly, was motivated by a combination of considerations that do not apply equally to other ED diagnoses. AN carries the highest fatality rate among psychiatric disorders (Neale & Hudson, 2020; Van Eeden et al., 2021; Polskaya et al., 2023) and underwent specific diagnostic changes in the DSM-5 (APA, 2013), most notably the removal of the amenorrhea criterion, which makes pre-DSM-5 studies of AN particularly susceptible to diagnostic inconsistency. Additionally, AN offers a methodological advantage not shared by most other ED diagnoses: its two subtypes, AN-R and AN-BP, represent internally contrasting clinical profiles within the same diagnosis. This makes AN uniquely suited to a within-disorder test of hypotheses about the role of impulsive and binge-purge behaviors in NSSI co-occurrence, which represents a comparison that cannot be replicated in a review treating all EDs as equivalent.

## 2.2 Search strategy

Study selection and data extraction were conducted following the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA; Page et al., 2021) guidelines. Articles searching was conducted through the databases Pubmed, Web of Science (all databases), Scopus, and EBSCOhost (PsycINFO, PsycARTICLES, PSYINDEX, MEDLINE, ERIC) using the following keywords "Self-Harm", "Non-Suicidal Self-Injury", "Self-Injurious Behavior", "Eating Disorders", and "Anorexia Nervosa" connected together with the operators AND and OR.

## 2.3 Eligibility Criteria

Automatic filters were used to select only articles published in English between 2014 and 2024. This timeframe was chosen because NSSI has gained its position and conceptualization as a specific disorder only since the publication of the fifth edition of the Diagnostic and Statistical Manual of Mental Disorder (DSM-5; APA, 2013). In addition to the characteristics already highlighted, other inclusion criteria used during the study selection have been: the retention of a clinical sample of patients with a diagnosis of AN according to DSM-5 (APA, 2013) criteria; a diagnosis made by certified mental health professionals; a longitudinal or cross sectional study design. All studies that did not meet these criteria were excluded. All theoretical articles and previous systematic reviews were rejected as well. Duplicates were excluded, and it was retained only the study with the most relevant data for review purposes.

## 2.4 Selection of articles

Initial search from all databases provided 1.407 articles. From the total count 798 of them were duplicates. The 609 studies identified were then screened to read titles and abstracts. This process provided us with 61 articles, that were fully read and assessed for eligibility. Among those, only 15 met all the inclusion criteria and were used in the review. The selection process is reported in Figure 1.

## 2.5 Data extraction and coding

Data were extracted by a single author. Where available, the following information were included: (a) authors of the study; (b), publication year; (c), country where the study was conducted; (d), sample size; (e), number of people in the sample with comorbidity of NSSI; (f), gender of the people in each sample; (g), instrument used to assess AN, specifying whether self-report measures or clinician-ad-

ministered interviews were employed; (h) instruments used to assess NSSI, with the same distinction between self-report and clinician-administered assessment; (i), age of the sample; (j), treatment setting.

## 2.6 Risk of bias assessment

Risk of bias was evaluated using the Quality assessment checklist for prevalence studies (Hoy et al., 2012) and evaluated by two independent reviewers. The quality of the 15 eligible studies was assessed on there being: (1) target population as a close representation of the national population; (2) target population as a true representation of the AN; (3) the target population has randomized (e.g., simple random sampling, stratified random sampling, cluster sampling, systematic sampling); (4) likelihood of non-response bias minimal assessed in term of percentage of completers >75%; (5) data collected directly from the subjects; (6) an acceptable case definition in terms of diagnostic criteria based on DSM-5 or subsequent; (7) reliability and validity of the two outcome measures; (8) the same mode of data collection used for all subjects; (9) The paper presented appropriate numerators and denominators for the two outcome measures; (10) Overall risk of study bias (i.e., 0-3 low risk; 4-6 moderate risk; 7-9 high risk). Studies assessment is synthetized in Table 1.

## 2.7 Statistical analyses

Data are presented as absolute numbers and percentages. To determine if NSSI was differently distributed across AN subtypes, in all articles that displayed information on the frequency of NSSI in the different AN subtypes, odds ratios (ORs) with 95% Confidence intervals (Cis) were calculated using the restrictive category as reference (i.e., AN-R).

## 3. Results

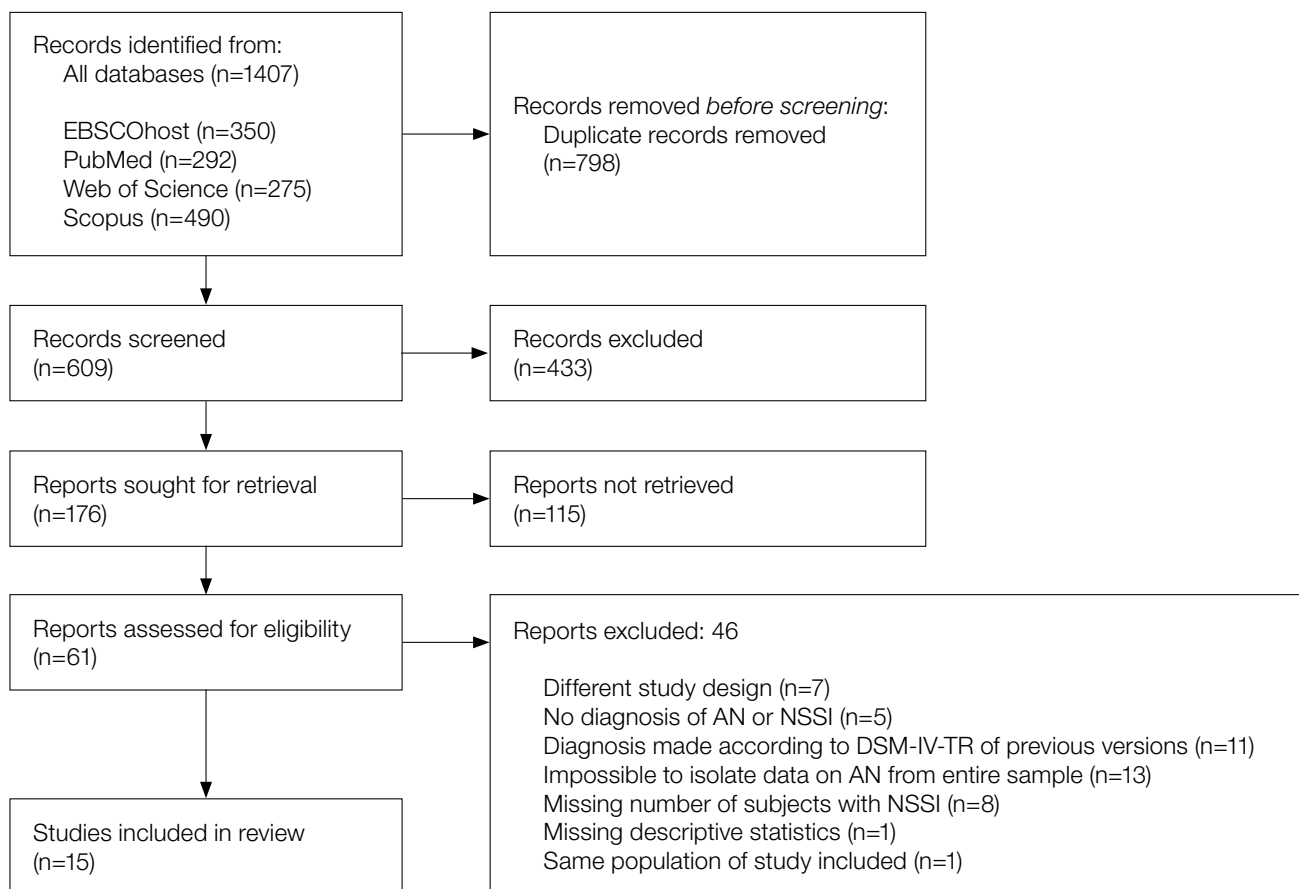
### 3.1 Characteristics of included studies

The study conducted, selected 15 studies published between 2014 and 2024. These studies assessed a total of 2000 patients coming from 8 different countries, specifically: South Korea, Spain, Italy, USA, The Netherlands, Belgium, Germany, and Portugal. Six studies (40%) were conducted only on adolescent patients<sup>1</sup>. Among the studies assessed, seven of them (46.7%) include a sample made only by inpatients<sup>2</sup>; two studies (13.4%) involved a sample made exclu-

<sup>1</sup> Following Table 1, study ID: 2, 3, 7, 8, 11, 12.

<sup>2</sup> Following Table 1, Study ID: 2, 3, 6, 8, 11, 12, 13.

**Figure 1.** Flow chart synthesizing the articles selection process



**Table 1.** Risk of Bias assessment

ID	Study	1	2	3	4	5	6	7	8	9	10
1	<a href="#">Ahn et al., 2021</a>	1	0	1	0	0	0	1	0	0	3 Low
2	<a href="#">Arnold et al., 2023</a>	1	0	1	0	0	0	0	0	0	2 Low
3	<a href="#">Buelens et al., 2020</a>	1	1	1	0	1	0	0	1	0	5 Moderate
4	<a href="#">Carlson et al., 2018</a>	1	0	1	0	0	0	1	0	0	3 Low
5	<a href="#">Cella et al., 2022</a>	1	0	1	0	0	0	0	0	0	2 Low
6	<a href="#">Claes et al., 2021</a>	1	0	1	0	1	0	0	0	0	3 Low
7	<a href="#">Davico et al., 2019</a>	1	1	1	0	0	0	1	0	0	4 Moderate
8	<a href="#">Dzombak et al., 2020</a>	1	1	1	0	0	0	1	0	0	4 Moderate
9	<a href="#">Giner-Bartolome et al., 2017</a>	1	1	1	0	0	0	0	0	0	3 Low
10	<a href="#">Gonçalves et al., 2015</a>	1	0	1	0	0	0	0	0	0	2 Low
11	<a href="#">Mereu et al., 2022</a>	1	1	1	0	0	0	0	0	0	3 Low
12	<a href="#">Riva et al., 2022</a>	1	1	1	0	1	0	1	0	0	5 Moderate
13	<a href="#">Rodríguez-Lopez et al., 2021</a>	1	1	1	0	0	0	1	0	0	4 Moderate
14	<a href="#">Smithuis et al., 2018</a>	1	0	1	1	0	0	0	0	0	3 Low
15	<a href="#">Vieira et al., 2017</a>	1	0	1	0	0	0	1	0	0	3 Low

sively by outpatients (Ahn et al., 2021; Vieira et al., 2017). The remaining studies either comprised both inpatient and outpatients (N=2; 13.4%) or did not disclose this information (N=4; 26,7%). The descriptive characteristics of the studies included were synthesized in Table 2.

### 3.2 Non-Suicidal Self-Injury (NSSI)

Results showed co-occurrence rates among AN and NSSI ranged between 14.1% (Arnold et al., 2023) and 62.9% (Smithuis et al., 2018); with the lower extreme represented by a sample uniquely made of adolescents inpatients and the higher extreme is represented by a sample made of adults in and outpatients. Data obtained from samples made uniquely by inpatients vary between 14.1% (Arnold et al., 2023) and 50.3% (Claes et al., 2021), whereas those made only by outpatients show a smaller variation between 14.6% (Vieira et al., 2017) and 17.9% (Ahn et al., 2021). High co-occurrence rates among these disorders were shown also in pediatric samples. In fact, the percentage of patients with these characteristics varied between 14.1% (Arnold et al., 2023) and 43.8% (Davico et al., 2019). On the other hand, this range varied between 14.6% (Vieira et al., 2017) and 62.9% (Smithuis et al., 2018) in samples of adults. In line with current literature, also in this study higher co-occurrence rates were found in people with the binge-purging subtype of AN rather than in people with the restrictive subtype of this disorder. Specifically, people affected by AN-R showed co-occurrence rates between 8.3% (Arnold et al., 2023) and 41.4% (Buelens et al., 2020), while those affected by AN-BP varied between 12.55% (Ahn et al., 2021) and 80% (Davico et al., 2019). However, among the studies included, four of them (Cella et al., 2022; Dzombak et al., 2020; Rodriguez-Lopez et al., 2021; Smithuis et al., 2018) gave an overall prevalence of NSSI in the sample included, without specifying the different AN subtypes. Among those studies, prevalence varied between 26.1% (Cella et al., 2022) and 62.9% (Smithuis et al., 2018).

Where prevalence of NSSI was specified for the different AN subtypes, odds ratios (ORs) were calculated to evaluate if this condition was more prevalent in a particular diagnosis. Specifically, eight studies (53.3%) divided the sample in patients with AN-R or AN-BP subtype, thus were included in the ORs calculation. Data on AN-R was used as the reference category. Data are synthesized in Table 3. Out of the eight studies where data on the prevalence of NSSI across different AN subtypes were available, seven (87.5%) reported that NSSI rates were significantly higher in AN-BP than in AN-R. These results showed that the likelihood of having NSSI in patients with binge-purging

behaviors were between two-fold and seven times higher (ORs between 1.75 and 7.18) than in patients who have restrictive behaviors. Only one study (Ahn et al., 2021) reported higher prevalence of NSSI in AN-R patients both versus AN-BP (OR = 0.34; 95%CI = 0.19-0.65).

## 4. Discussion

The data reviewed here confirm that NSSI is a clinically relevant phenomenon in patients with AN, with co-occurrence rates ranging from 14.1% (Arnold et al., 2023) to 62.9% (Smithuis et al., 2018) depending on the sample. This range is consistent with figures reported by prior reviews and meta-analyses (Cucchi et al., 2016; Kirkpatrick et al., 2023; Sohn et al., 2023; Sesboüé et al., 2025). At the same time, the breadth of the range itself illustrates a problem that recurs throughout the literature on this topic: variability in estimates is large enough to limit the confidence with which any single prevalence figure can be cited. The consistent direction of the OR data, with AN-BP showing higher NSSI rates in 7 out of 8 studies, fits reasonably well with what both the functional and transdiagnostic frameworks would predict. In Nock and Prinstein's (2004) terms, purging and NSSI share a common mechanism: both reduce aversive states rapidly through bodily action. This profile maps onto the AN-BP presentation, where impulsivity and emotional instability are central features, more naturally than onto AN-R, which is typically characterized by over-control. Fairburn et al. (2003) make a related point within the transdiagnostic model, associating mood intolerance and its behavioral consequences, including NSSI, more closely with binge-purge presentations. Klonsky's (2007) findings on affect regulation as the dominant function of NSSI reinforce this reading. If this interpretation is correct, the higher NSSI rates in AN-BP may not be explained by binge-purge behavior per se, but by the emotional dysregulation that underlies it, a distinction with practical implications, since it points to affect regulation as the primary therapeutic target in patients with both conditions. These findings point to several directions for future work. A first priority is the development of standardized, agreed-upon assessment criteria for NSSI in ED populations: the variability documented here is partly a measurement problem, and it will not resolve until the field converges on common instruments and definitions. A second line of inquiry concerns shared risk factors (*i.e.*, the neurobiological and psychological mechanisms that increase vulnerability to both conditions simultaneously). The theoretical con-

ID	Study	Nation	Sample	NSSI	Sex [n (%)]	Age [m (sd)]	ED assessment instrument (method)	NSSI assessment instrument (method)	Care frame
1	Ahn et al., 2021	South Korea	326 79 AN-R 247 AN-BP	54 (16.56%) AN-R 23 (29.11%) AN-R 31 (12.55%) AN-BP	F:100%	23.12 (SD 6.09)	Semi-structured interviews (CI) EDI-2 (SR)	Semi-structured interviews (CI)	OUT
2	Arnold et al., 2023	Germany	298 242 AN-R 56 AN-BP	42 (14.09%) AN-R 20 (8.3%) AN-R 22 (38.3%) AN-BP	F:288 (96.6%) M:10 (3.4%)	Median 15.6	Retrospective chart review	Retrospective chart review	IN
3	Buelens et al., 2020	Belgium	87 AN-R	36 (41.37%) AN-R	F:100%	15.93 (SD 0.98)	EDE (SR) Psychiatric interview (CI)	SIQ-TR (SR)	IN
4	Carlson et al., 2018	Spain	43 24 AN-R 19 AN-BP	13 (30.23%) AN-R 6 (25%) AN-R 7 (36.84%) AN-BP	F:100%	AN-R: 21.00 (SD 3.15) AN-BP: 26.32 (SD 9.36)	SCID-I (CI) YFAS 2.0 (SR) EDI-2 (SR)	Single question to assess NSSI (CI)	*
5	Cella et al., 2022	Italy	46 AN	12 (26.10%) AN	F: 42 (91.3%) M: 4 (8.7%)	24.49 (SD 10.74)	SCID-5-CV (CI) EDI-3 (SR)	DSHI (SR) Symptoms checklist for non-suicidal self-injury disorder (CI)	*
6	Claes et al., 2021	Belgium	318 169 AN-R 149 AN-BP	160 (60.31%) AN-R 63 (37.3%) AN-R 97 (65.5%) AN-BP	F:100%	20.90 (SD 5.80)	EDES (SR)	SIQ-TR (SR)	IN
7	Davico et al., 2019	Italy	73 63 AN-R 10 AN-BP	32 (43.84%) AN-R 24 (38.10%) AN-R 8 (80%) AN-BP	F:100%	13.77 (SD 1.93)	Psychiatric evaluation conducted by specialists (CI)	Psychiatric evaluation conducted by specialists (CI)	IN OUT
8	Dzombak et al., 2020	USA	100 AN	30 (30%) AN	F: 90 (90%) M: 10 (10%)	14.28 (SD 1.74)	EDE (SR)	Retrospective medical records	IN
9	Giner-Bartolome et al., 2017	Spain	26 21 AN-R 5 AN-BP	4 (15.38%) AN-R 3 (14%) AN-R 1 (20%) AN-BP	F:100%	ED: 31.77 (SD 9.70) ED+NSSI: 26.83 (SD 8.78)	Clinical interview (CI) SCID-I (CI) EDI-2 (SR)	Clinical interview (CI) SCID-I (CI)	*
10	Gonçalves et al., 2015	Portugal	100 64 AN-R 36 AN-BP	35 (35%) AN-R 14 (21.9%) AN-R 21 (58.9%) AN-BP	F:100%	21.58 (SD 5.19)	EDE (SR)	Semi-structured clinical interview to assess NSSI (CI)	*
11	Mereu et al., 2022	Italy	100 66 AN-R 34 AN Atypical	19 (19%) AN-R 15 (22.73%) AN-R 4 (11.76%) AN Atypical	F: 89 (89%) M: 11 (11%)	Median 15.2	EDI-3 (SR) K-SADS-PL (CI)	C-SSRS (SR)	IN
12	Riva et al., 2022	Italy	253 208 AN-R 45 AN-BP	40 (15.81%) AN-R 24 (11.54%) AN-R 16 (35.56%) AN-BP	F:100%	No NSSI: 14.7 (SD 1.87) NSSI: 15.5 (SD 1.41)	Patient medical records EDI-3 (SR) SCL-90-R (SR) CGAS (SR)	Patient medical records	IN
13	Rodriguez-Lopez et al., 2021	Spain	36 AN	12 (33.33%) AN	F:100%	20.05 (SD 4.09)	Clinical interview (CI) BSQ (SR)	Clinical interview (CI)	IN
14	Smithuis et al., 2018	Netherlands	98 AN	61 (62.9%) AN	F:96 (98%) M: 2 (2%)	25.44 (SD 8.55)	EDE (SR) LIFE (CI)	SIQ-TR (SR)	IN OUT
15	Vieira et al., 2017	Portugal	96 AN-R	14 (14.58%) AN-R	F:100%	22.12 (SD 6.31)	Oxford Risk Factor Interview for Eating Disorders (CI)	*	OUT

\*missing data

Abbreviations: **TOT**: total sample; **AN-R**: Anorexia Nervosa Restrictive Subtype; **AN-BP**: Anorexia Nervosa Binge-Purging Subtype; **AN**: Anorexia Nervosa; **F**: Female; **M**: Male; **SD**: Standard Deviation; **EDI-2**: Eating Disorders Inventory-2; **SR**: Self-Report; **CI**: Clinical interview; **YFAS 2.0**: Yale Food Addiction Scale 2.0; **EDE**: Eating Disorders Examination; **SIQ-TR**: Self-Injury Questionnaire-Treatment Related; **SCID-I**: The Structured Clinical Interview for DSM-IV Axis I Disorders; **SCID-5-CV**: Structured Clinical Interview for DSM-5 Disorders, Clinician Version; **EDI-3**: Eating Disorder Evaluation Scale; **EDI-3**: Eating Disorder Inventory, third edition; **SIQ**: Suicidal Ideation Questionnaire; **EDI**: Eating Disorders Inventory; **K-SADS-PL**: Schedule for Affective Disorders and Schizophrenia for School-Age Children/Present and Lifetime Version; **C-SSRS**: Columbia-suicide severity rating Scale; **SCID-5-CV**: Structured clinical interview for DSM-5 disorders, Clinician version; **SCL-90-R**: Symptom Checklist 90-Revised; **CGAS**: Children's Global Assessment Scale; **LIFE**: Longitudinal Interval Follow-up Evaluation; **BSQ**: Body Shape Questionnaire; **DSHI**: Deliberate Self-Harm Inventory; **IN**: Inpatient; **OUT**: Outpatient

**Table 2.** Descriptive characteristics of the samples used in each study

**Table 3.** NSSI distribution in each sample of patients with AN and odds ratio calculations

ID	Study	Sample	NSSI	Odds Ratio
1	Ahn et al., 2021	326 79 AN-R 247 AN-BP	54 (16.56%) 23 (29.11%) AN-R 31 (12.55%) AN-BP	AN-BP AN-R= 0.34 (CI= 0.19-0.65)
2	Arnold et al., 2023	298 242 AN-R 56 AN-BP	42 (14.09%) 20 (8.3%) AN-R 22 (38.3%) AN-BP	AN-BP AN-R= 7.18 (CI= 3.55-14.54)
3	Buelens et al., 2020	87 AN-R	36 (41.37%) AN-R	*
4	Carlson et al., 2018	43 24 AN-R 19 AN-BP	13 (30.23%) 6 (25%) AN-R 7 (36.84%) AN-BP	AN-BP AN-R= 1.75 (CI= 0.47-6.5)
5	Cella et al., 2022	46 AN	12 (26.10%) AN	*
6	Claes et al., 2021	318 169 AN-R 149 AN-BP	160 (50.31%) 63 (37.3%) AN-R 97 (65.5%) AN-BP	AN-BP AN-R= 3.14 (CI=1.98-4.97)
7	Davico et al., 2019	73 63 AN-R 10 AN-BP	32 (43.84%) 24 (38.10%) AN-R 8 (80%) AN-BP	AN-BP AN-R= 6.5 (CI=1.27-33.20)
8	Dzombak et al., 2020	100 AN	30 (30%)AN	*
9	Giner-Bartolome et al., 2017	26 21 AN-R 5 AN-BP	4 (15.38%) 3 (14%) AN-R 1 (20%) AN-BP	AN-BP AN-R= 1.5 (CI=0.12-18.44)
10	Gonçalves et al., 2015	100 64 AN-R 36 AN-BP	35 (35%) 14 (21.9%) AN-R 21 (58.9%) AN-BP	AN-BP AN-R= 5.00 (CI=2.06-12.16)
11	Mereu et al., 2022	100 66 AN-R 34 AN Atypical	19 (19%) 15 (22.73%) AN-R 4 (11.76%) AN Atypical	*
12	Riva et al., 2022	253 208 AN-R 45 AN-BP	40 (15.81%) 24 (11.54%) AN-R 16 (35.56%) AN-BP	AN-BP AN-R= 4.23 (CI= 2.01-8.90)
13	Rodriguez-Lopez et al., 2021	36 AN	12 (33.33%) AN	*
14	Smithuis et al., 2018	98 AN	61 (62.9%) AN	*
15	Vieira et al., 2017	96 AN-R	14 (14.58%) AN-R	*

\* data were not divided among the different AN subtypes. Study 11 (Mereu et al., 2022) did not include an AN-BP subgroup; the second diagnostic category was AN Atypical. OR calculation was therefore not applicable.

Abbreviations: **TOT**: total sample; **AN-R**: Anorexia Nervosa Restrictive Subtype; **AN-BP**: Anorexia Nervosa Binge-Purging Subtype; **AN**: Anorexia Nervosa

vergences discussed above (Claes & Muehlenkamp, 2014; Oudijn et al., 2022) offer a useful starting framework, but they remain largely untested empirically. A third implication concerns treatment: if AN and NSSI share affect-regulatory functions, addressing emotion dysregulation directly rather than targeting each condition separately may improve outcomes for patients with both presentations (Washburn et al., 2023).

#### 4.1 Limitations

The present review has several limitations that should be considered when interpreting its findings. First, even within the DSM-5 restriction, the operationalization of NSSI was inconsistent across included studies: the terms NSSI, self-harm, and self-injurious behavior were used in partially overlapping but distinct ways, and assessment tools differed widely. These differences in assessment methods may partly explain the substantial variability in findings

across studies. Such variability, however, may also be influenced by the heterogeneity of the samples examined. In this regard, some studies focused exclusively on individuals receiving outpatient treatment, whereas others included only inpatient populations, while additional studies adopted mixed samples comprising both outpatients and inpatients. Moreover, age composition of the samples represents a further source of variability that could contribute to the heterogeneity of the results obtained. In fact, six of the fifteen included studies recruited exclusively adolescent populations. Adolescents may differ from adults in their willingness and capacity to disclose NSSI, for reasons that are not simply about symptom severity: concerns about parental notification, the social stigma associated with self-injury in school-age peer groups, and a generally lower threshold for clinical intervention following disclosure can each suppress reporting in younger samples. The gap between the lowest rates observed in adolescent inpatient studies (14.1%, Arnold et al., 2023) and the highest in mixed adult samples (62.9%, Smithuis et al., 2018) is large enough to raise the question of whether these differences reflect genuine prevalence differences or measurement artifacts. This moderator deserves direct attention in future research. A separate limitation concerns the nature of the phenomenon itself, as specialists cannot empirically evaluate NSSI. Instead, they must rely on self-reported surveys and interviews for assessment. For this reason, certain participants may engage in deception by either inflating, downplaying, or denying their involvement in such activities. On these grounds, assessment of NSSI should rely on multi-item, behaviorally specific instruments rather than single direct questions, and clinicians should be trained to probe systematically rather than wait for spontaneous disclosure.

## References

- Ahn, J., Lee, J. H., & Jung, Y. C. (2021). Identifying Predictors of Non-Suicidal Self-Injuries in Individuals with Eating Disorders. *Yonsei Medical Journal*, 62(2), 159–163. <https://doi.org/10.3349/ymj.2021.62.2.159>
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders Fifth Edition (DSM-5)*. Washington, D.C.: APA (trad it.: Manuale diagnostico e statistico dei disturbi mentali. Quinta edizione. Milano: Raffaello Cortina, 2014).
- Amiri, S., & Khan, M. A. (2023). Prevalence of non-suicidal self-injury, suicidal ideation, suicide attempts, suicide mortality in eating disorders: a systematic review and meta-analysis. *Eating Disorders*, 31(5), 487–525. <https://doi.org/10.1080/10640266.2023.2196492>
- Arnold, S., Correll, C. U., & Jaite, C. (2023). Frequency and correlates of lifetime suicidal ideation and suicide attempts among consecutively hospitalized youth with anorexia nervosa and bulimia nervosa: results from a retrospective chart review. *Borderline Personality Disorder and Emotion Dysregulation*, 10(1). <https://doi.org/10.1186/s40479-023-00216-1>
- Blasco-Fontecilla, H., Fernández-Fernández, R., Colino, L., Fajardo, L., Perteguer-Barrio, R., & de Leon, J. (2016). The Addictive Model of Self-Harming (Non-suicidal and Suicidal) Behavior. *Frontiers in psychiatry*, 7, 8. <https://doi.org/10.3389/fpsy.2016.00008>
- Boltri, M., & Sapuppo, W. (2021). Anorexia Nervosa and Autism Spectrum Disorder: A Systematic review. *Psychiatry Research*, 306, 114271. <https://doi.org/10.1016/j.psychres.2021.114271>
- Bresin, K., & Gordon, K. H. (2013). Endogenous opioids and nonsuicidal self-injury: a mechanism of affect regulation. *Neuroscience and biobehavioral reviews*, 37(3), 374–383. <https://doi.org/10.1016/j.neubiorev.2013.01.020>
- Brown, R. C., & Plener, P. L. (2017). Non-suicidal Self-Injury in Adolescence. *Current psychiatry reports*, 19(3), 20. <https://doi.org/10.1007/s11920-017-0767-9>
- Buelens, T., Luyckx, K., Verschuere, M., Schoevaerts, K., Dierckx, E., Depestele, L., & Claes, L. (2020). Temperament and Character Traits of Female Eating Disorder Patients with(out) Non-Suicidal Self-Injury. *Journal of Clinical Medicine*, 9(4), 1207. <https://doi.org/10.3390/jcm9041207>
- Cardi, V., Mallorquí-Bagué, N., Albano, G., Monteleone, A. M., Fernández-Aranda, F., & Treasure, J. (2018). Social Difficulties as risk and maintaining factors in Anorexia Nervosa: A Mixed-Method Investigation. *Frontiers in Psychiatry*, 9. <https://doi.org/10.3389/fpsy.2018.00012>
- Carlson, L., Steward, T., Agüera, Z., Mestre-Bach, G., Magaña, P., Granero, R., Jiménez-Murcia, S., Claes, L., Gearhardt, A. N., Menchón, J. M., & Fernández-Aranda, F. (2018). Associations of food addiction and nonsuicidal self-injury among women with an eating disorder: A common strategy for regulating emotions? *European Eating Disorders Review*, 26(6), 629–637. <https://doi.org/10.1002/erv.2646>
- Cella, S., Cipriano, A., Aprea, C., Milano, W., Carizzone, F., & Cotrufo, P. (2022). Non-suicidal self-injury in eating disorders: Prevalence, characteristics, DSM-5 proposed diagnostic criteria, and correlates. *Journal of Affective Disorders Reports*, 7, 100292. <https://doi.org/10.1016/j.jadr.2021.100292>
- Claes, L., Buelens, T., Depestele, L., Dierckx, E., Schoevaerts, K., & Luyckx, K. (2021). Obsessive–compulsive symptoms in female patients with an eating disorder with or without impulsive non-suicidal self-injury. *European Eating Disorders Review*, 29(4), 663–669. <https://doi.org/10.1002/erv.2836>
- Claes, L., & Muehlenkamp, J. J. (2014). *Non-Suicidal Self-Injury in Eating Disorders: Advancements in Etiology and Treatment* (2014th ed.). Springer-Verlag Berlin Heidelberg.
- Claes, L., Smits, D., & Bijttebier, P. (2014). The Dutch Version of the Emotion Reactivity Scale. *European Journal of Psychological Assessment*, 30(1), 73–79. <https://doi.org/10.1027/1015-5759/a000171>
- Cucchi, A., Ryan, D., Konstantakopoulos, G., Stroumpa, S., Kaçar, A. Ş., Renshaw, S., Landau, S., & Kravariti, E. (2016). Lifetime prevalence of non-suicidal self-injury in patients with eating disorders: a systematic review and meta-analysis.

- sis. *Psychological Medicine*, 46(7), 1345–1358. <https://doi.org/10.1017/s0033291716000027>
- Cullen, K. R., Westlund, M. K., LaRiviere, L. L., & Klimes-Dougan, B. (2013). An adolescent with nonsuicidal self-injury: a case and discussion of neurobiological research on emotion regulation. *The American journal of psychiatry*, 170(8), 828–831. <https://doi.org/10.1176/appi.ajp.2013.12121598>
- Dalle Grave, R., El Ghoch, M., Sartirana, M., & Calugi, S. (2016). Cognitive behavioral therapy for anorexia nervosa: An update. *Current Psychiatry Reports*, 18(1), 2. <https://doi.org/10.1007/s11920-015-0643-4>
- Davico, C., Amianto, F., Gaiotti, F., Lasorsa, C., Peloso, A., Bosisia, C., Vesco, S., Arletti, L., Reale, L., & Vitiello, B. (2019). Clinical and personality characteristics of adolescents with anorexia nervosa with or without non-suicidal self-injurious behavior. *Comprehensive Psychiatry*, 94, 152115. <https://doi.org/10.1016/j.comppsy.2019.152115>
- Devine D. P. (2012). Animal models of self-injurious behaviour: an overview. *Methods in molecular biology* (Clifton, N.J.), 829, 65–84. [https://doi.org/10.1007/978-1-61779-458-2\\_4](https://doi.org/10.1007/978-1-61779-458-2_4)
- Devine D. P. (2019). Animal Models of Self-Injurious Behavior: An Update. *Methods in molecular biology* (Clifton, N.J.), 2011, 41–60. [https://doi.org/10.1007/978-1-4939-9554-7\\_3](https://doi.org/10.1007/978-1-4939-9554-7_3)
- Di Lodovico, L., Vansteene, C., Poupon, D., Gorwood, P., & Duriez, P. (2023). Food avoidance in anorexia nervosa: associated and predicting factors. *Eating and Weight Disorders - Studies on Anorexia, Bulimia and Obesity*, 28(1). <https://doi.org/10.1007/s40519-023-01545-4>
- Dzombak, J. W., Haynos, A. F., Rienecke, R. D., & van Huysse, J. L. (2020). Brief report: Differences in nonsuicidal self-injury according to binge eating and purging status in an adolescent sample seeking eating disorder treatment. *Eating Behaviors*, 37, 101389. <https://doi.org/10.1016/j.eatbeh.2020.101389>
- Fairburn, C. G., Cooper, Z., & Shafran, R. (2003). Cognitive behaviour therapy for eating disorders: a “transdiagnostic” theory and treatment. *Behaviour Research and Therapy*, 41(5), 509–528. [https://doi.org/10.1016/s0005-7967\(02\)00088-8](https://doi.org/10.1016/s0005-7967(02)00088-8)
- Favaro, A., Ferrara, S., & Santonastaso, P. (2007). Self-Injurious Behavior in a Community Sample of Young Women. *The Journal of Clinical Psychiatry*, 68(01), 122–131. <https://doi.org/10.4088/jcp.v68n0117>
- Frick, A., Åhs, F., Engman, J., Jonasson, M., Alaie, I., Björkstrand, J., Frans, Ö., Faria, V., Linnman, C., Appel, L., Wahlstedt, K., Lubberink, M., Fredrikson, M., & Furmark, T. (2015). Serotonin Synthesis and Reuptake in Social Anxiety Disorder: A Positron Emission Tomography Study. *JAMA psychiatry*, 72(8), 794–802. <https://doi.org/10.1001/jamapsychiatry.2015.0125>
- Giner-Bartolome, C., Mallorquí-Bagué, N., Tolosa-Sola, I., Steward, T., Jimenez-Murcia, S., Granero, R., & Fernandez-Aranda, F. (2017). Non-suicidal Self-Injury in Eating Disordered Patients: Associations with Heart Rate Variability and State-Trait Anxiety. *Frontiers in Psychology*, 8(1163). <https://doi.org/10.3389/fpsyg.2017.01163>
- Gonçalves, S., Machado, B., Silva, C., Crosby, R. D., Lavender, J. M., Cao, L., & Machado, P. P. P. (2015). The Moderating Role of Purging Behaviour in the Relationship Between Sexual/Physical Abuse and Nonsuicidal Self-Injury in Eating Disorder Patients. *European Eating Disorders Review*, 24(2), 164–168. <https://doi.org/10.1002/erv.2415>
- Halls, D., Batchelor, R., Holetic, V., Leppänen, J., Williams, S., & Tchanturia, K. (2023). Longitudinal exploration of biopsychosocial profiles in individuals with anorexia nervosa. *Journal of Psychiatric Research*, 167, 16–22. <https://doi.org/10.1016/j.jpsychires.2023.09.001>
- Hoy, D., Brooks, P., Woolf, A., Blyth, F., March, L., Bain, C., Baker, P., Smith, E., & Buchbinder, R. (2012). Assessing risk of bias in prevalence studies: modification of an existing tool and evidence of interrater agreement. *Journal of Clinical Epidemiology*, 65(9), 934–939. <https://doi.org/10.1016/j.jclinepi.2011.11.014>
- Jacobson, C. M., & Gould, M. (2007). The Epidemiology and Phenomenology of Non-Suicidal Self-Injurious Behavior Among Adolescents: A Critical Review of the Literature. *Archives of Suicide Research*, 11(2), 129–147. <https://doi.org/10.1080/1381110701247602>
- Kirkpatrick, R. H., Booij, L., Vance, A., Marshall, B., Kanellos-Sutton, M., Marchand, P., & Khalid-Khan, S. (2019). Eating disorders and substance use in adolescents: How substance users differ from nonsubstance users in an outpatient eating disorders treatment clinic. *International Journal of Eating Disorders*, 52(2), 175–182. <https://doi.org/10.1002/eat.23017>
- Kirkpatrick, R. H., Breton, É., Biorac, A., Munoz, D. P., & Booij, L. (2023). Non-suicidal self-injury among individuals with an eating disorder: A systematic review and prevalence meta-analysis. *International Journal of Eating Disorders*. <https://doi.org/10.1002/eat.24088>
- Klonsky, E. D. (2007). The functions of deliberate self-injury: A review of the evidence. *Clinical Psychology Review*, 27(2), 226–239. <https://doi.org/10.1016/j.cpr.2006.08.002>
- Lamanna, J., Sulpizio, S., Ferro, M., Martoni, R., Abutalebi, J., & Malgaroli, A. (2019). Behavioral assessment of activity-based-anorexia: how cognition can become the drive wheel. *Physiology & behavior*, 202, 1–7. <https://doi.org/10.1016/j.physbeh.2019.01.016>
- Li, Z., Halls, D., Byford, S., & Tchanturia, K. (2021). Autistic characteristics in eating disorders: Treatment adaptations and impact on clinical outcomes. *European Eating Disorders Review*, 30(5), 671–690. <https://doi.org/10.1002/erv.2875>
- Mereu, A., Fantoni, T., Caini, S., Monzali, F., Roselli, E., Taddei, S., Lucarelli, S., & Pisano, T. (2022). Suicidality in adolescents with onset of anorexia nervosa. *Eating and Weight Disorders-studies on Anorexia Bulimia and Obesity*, 27(7), 2447–2457. <https://doi.org/10.1007/s40519-022-01384-9>
- Muehlenkamp, J. J., Claes, L., Smits, D., Peat, C. M., & Vandereycken, W. (2011). Non-suicidal self-injury in eating disordered patients: A test of a conceptual model. *Psychiatry Research*, 188(1), 102–108. <https://doi.org/10.1016/j.psychres.2010.12.023>
- Neale, J., & Hudson, L. (2020). Anorexia nervosa in adolescents. *British Journal of Hospital Medicine*, 81(6), 1–8. <https://doi.org/10.12968/hmed.2020.0099>
- Nock, M. K., & Prinstein, M. J. (2004). A functional approach to the assessment of self-mutilative behavior. *Journal of Consulting and Clinical Psychology*, 72(5), 885–895. <https://doi.org/10.1037/0022-006X.72.5.885>
- O'Hara, C. B., Campbell, I. C., & Schmidt, U. (2015). A reward-centred model of anorexia nervosa: a focussed narrative review of the neurological and psychophysiological literature. *Neuroscience and biobehavioral reviews*, 52, 131–152. <https://doi.org/10.1016/j.neubiorev.2015.02.012>

- Oudijn, M., Linders, J., Mocking, R., Lok, A., van Elburg, A., & Denys, D. (2022). Psychopathological and Neurobiological Overlap Between Anorexia Nervosa and Self-Injurious Behavior: A Narrative Review and Conceptual Hypotheses. *Frontiers in psychiatry*, 13, 756238. <https://doi.org/10.3389/fpsy.2022.756238>
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., . . . Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*, n71. <https://doi.org/10.1136/bmj.n71>
- Pleplé, A., Lalanne, C., Huas, C., Mattar, L., Hanachi, M., Flament, M. F., Carchon, I., Jouen, F., Berthoz, S., & Godart, N. (2021). Nutritional status and anxious and depressive symptoms in anorexia nervosa: a prospective study. *Scientific Reports*, 11(1). <https://doi.org/10.1038/s41598-020-79410-y>
- Polskaya, N. A., Basova, A. Y., Razvaliaeva, A. Y., Yakubovskaya, D. K., Власова, H. B., & Абрамова, A. A. (2023). Non-suicidal self-injuries and suicide risk in adolescent girls with eating disorders: associations with weight control, body mass index, and interpersonal sensitivity. *Consortium Psychiatricum*, 4(2), 65–77. <https://doi.org/10.17816/cp6803>
- Riva, A., Pigni, M., Bomba, M., & Nacinovich, R. (2022). Adolescents with anorexia nervosa with or without non-suicidal self-injury: clinical and psychopathological features. *Eating and Weight Disorders-studies on Anorexia Bulimia and Obesity*, 27(5), 1729–1737. <https://doi.org/10.1007/s40519-021-01311-4>
- Rodríguez-López, A., Rodríguez-Ortíz, E., & Romero-Gonzalez, B. (2021). Non-suicidal self-injury in patients with eating disorders: nuclear aspects. *Colombia Medica*, 52(1). <https://doi.org/10.25100/cm.v52i1.4342>
- Sapuppo, W., Ruggiero, G.M., Caselli, G., & Sassaroli, S. (2018). The body of cognitive and metacognitive variables of eating disorders: need of control, negative beliefs about worry uncontrollability and danger, perfectionism, self-esteem, and worry. *Israel Journal of Psychiatry and related Sciences*, 55, 1. PMID: 29916407 <https://pubmed.ncbi.nlm.nih.gov/29916407/>
- Sesboué, S., Grandclerc, S., Moro, M., Godart, N., & Blanchet, C. (2025). Non-suicidal self-injury and anorexia nervosa: A systematic scoping review. *L Encéphale*, 51(3), 318–331. <https://doi.org/10.1016/j.encep.2024.11.017>
- Sher, L., & Stanley, B. H. (2008). The role of endogenous opioids in the pathophysiology of self-injurious and suicidal behavior. *Archives of suicide research : official journal of the International Academy for Suicide Research*, 12(4), 299–308. <https://doi.org/10.1080/13811110802324748>
- Smithuis, L., Kool-Goudzwaard, N., de Man-van Ginkel, J. M., van Os-Medendorp, H., Berends, T., Dingemans, A., Claes, L., van Elburg, A. A., & van Meijel, B. (2018). Self-injurious behaviour in patients with anorexia nervosa: a quantitative study. *Journal of Eating Disorders*, 6(1), 26. <https://doi.org/10.1186/s40337-018-0214-2>
- Sohn, M. N., Dimitropoulos, G., Ramírez, A. C., McPherson, C., Anderson, A., Munir, A., Patten, S. B., McGirr, A., & Devoe, D. J. (2023). Non-suicidal self-injury, suicidal thoughts and behaviors in individuals with an eating disorder relative to healthy and psychiatric controls: A systematic review and meta-analysis. *International Journal of Eating Disorders*, 56(3), 501–515. <https://doi.org/10.1002/eat.23880>
- Spadini, S., Ferro, M., Lamanna, J., & Malgaroli, A. (2021). Activity-based anorexia animal model: a review of the main neurobiological findings. *Journal of eating disorders*, 9(1), 123. <https://doi.org/10.1186/s40337-021-00481-x>
- Stanley, B., Sher, L., Wilson, S., Ekman, R., Huang, Y. Y., & Mann, J. J. (2010). Non-suicidal self-injurious behavior, endogenous opioids and monoamine neurotransmitters. *Journal of affective disorders*, 124(1-2), 134–140. <https://doi.org/10.1016/j.jad.2009.10.028>
- St. Germain, S. A., & Hooley, J. M. (2012). Direct and indirect forms of non-suicidal self-injury: Evidence for a distinction. *Psychiatry Research*, 197(1–2), 78–84. <https://doi.org/10.1016/j.psychres.2011.12.050>
- Svirko, E., & Hawton, K. (2007). Self-Injurious Behavior and Eating Disorders: The Extent and Nature of the Association. *Suicide and Life-Threatening Behavior*, 37(4), 409–421. <https://doi.org/10.1521/suli.2007.37.4.409>
- Tchanturia, K., Hambrook, D., Curtis, H., Jones, T., Lounes, N., Fenn, K., Keyes, A., Stevenson, L., & Davies, H. (2013). Work and social adjustment in patients with anorexia nervosa. *Comprehensive Psychiatry*, 54(1), 41–45. <https://doi.org/10.1016/j.comppsy.2012.03.014>
- Tchanturia, K., Adamson, J., Leppänen, J., & Westwood, H. (2019). Characteristics of autism spectrum disorder in anorexia nervosa: A naturalistic study in an inpatient treatment programme. *Autism*, 23(1), 123–130. <https://doi.org/10.1177/1362361317722431>
- Trafford, A. M., Carr, M., Ashcroft, D. M., Chew-Graham, C., Cockcroft, E., Cybulski, Ł., Garavini, E., Garg, S., Kabir, T., Kapur, N., Temple, R., Webb, R. T., & Mok, P. L. H. (2023). Temporal trends in eating disorder and self-harm incidence rates among adolescents and young adults in the UK in the 2 years since onset of the COVID-19 pandemic: a population-based study. *The Lancet Child & Adolescent Health*, 7(8), 544–554. [https://doi.org/10.1016/s2352-4642\(23\)00126-8](https://doi.org/10.1016/s2352-4642(23)00126-8)
- Van Eeden, A. E., Van Hoeken, D., & Hoek, H. W. (2021). Incidence, prevalence and mortality of anorexia nervosa and bulimia nervosa. *Current Opinion in Psychiatry*, 34(6), 515–524. <https://doi.org/10.1097/ycp.0000000000000739>
- Vieira, A. I., Machado, B. C., Machado, P. P. P., Brandão, I., Roma-Torres, A., & Gonçalves, S. (2017). Putative Risk Factors for Non-Suicidal Self-Injury in Eating Disorders. *European Eating Disorders Review*, 25(6), 544–550. <https://doi.org/10.1002/erv.2545>
- Washburn, J. J., Soto, D., Osorio, C. A., & Slesinger, N. (2023). Eating disorder behaviors as a form of non-suicidal self-injury. *Psychiatry Research*, 319, 115002. <https://doi.org/10.1016/j.psychres.2022.115002>
- Zelkowitz, R. L., & Cole, D. A. (2018). Self-Criticism as a Transdiagnostic Process in Nonsuicidal Self-Injury and Disordered Eating: Systematic Review and Meta-Analysis. *Suicide and Life-Threatening Behavior*, 49(1), 310–327. <https://doi.org/10.1111/sltb.12436>