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Non-suicidal self-injurious behaviors in patients with eating disorders

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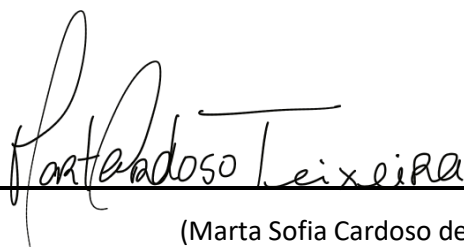
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Dedicatória

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Abstract

Background: Feeding and Eating Disorders (EDs) and Non-suicidal self-injury (NSSI), are considered forms of indirect and direct self-harm, respectively. Both disorders are quite common, representing important health concerns, that associate with significant functional impairment and mortality. These disordered behaviors often co-exist; however, not much is known about their co-occurrence and how it differs from engagement in only one of these self-harming behaviors.

Purpose of review: To review the literature about the occurrence of NSSI among patients with EDs, as a means of clarifying possible overlapping features between the two disorders concerning epidemiology, risk factors, etiology, and functions of behaviors, and to explore a possible influence of NSSI on the natural course of the ED. Management of comorbid ED and NSSI will also be briefly discussed.

Methods: Most articles were selected from PubMed and ScienceDirect. Corresponding authors were contacted for access to articles that were not freely accessible. Featured articles that did not originate from the initial search were obtained through a back-search of selected articles' references or were voluntarily sent by contacted authors. Articles from January 2004 to December 2021 were included. Narrative reviews, case reports, and editorial publications were excluded. Articles were selected according to title and abstract. This was followed by a full-text read.

Results: 71 publications were featured in this review. The articles included individuals with diagnoses of various EDs, individuals with no ED diagnosis but with ED symptomatology and/or individuals who engaged in NSSI. Most of the articles consisted of research on the clinical characteristics and functions of ED and NSSI. Very few longitudinal studies were retrieved from the search, which translated into a scarcity of information about putative risk factors and the long-term course of diseases.

Discussion: The strong relationship that has previously been established between these disorders is supported by several similarities in epidemiology, etiology, and risk factors. Certain psychiatric comorbidities are also common in both disorders, with emphasis on negative affectivity. Patients who engage in disordered eating behaviors and NSSI might do so to decrease the intensity of negative affectivity and obtain some relief. Besides possibly predicting worse ED symptomatology, NSSI is strongly associated with an increased risk of suicide attempts, especially among patients with comorbid psychiatric disorders.

Conclusion: Regardless of its growing clinical relevance, the co-occurrence of EDs and NSSI is still largely understudied. Longitudinal studies are now needed to better understand the long-term development and implications of the co-occurrence of the diseases and to explore new targeted approaches to patients engaging in both behaviors.

Keywords: Non-suicidal self-injury, Feeding and eating disorders, Anorexia Nervosa, Bulimia Nervosa, Binge-eating disorder, Suicide.

Resumo

Enquadramento: Perturbações do comportamento alimentar (PCA) e comportamentos auto-lesivos não suicidários são considerados formas de auto-lesão indireta e direta, respetivamente. Ambas as perturbações são bastante comuns, representando uma importante preocupação na saúde, uma vez que se associam a incapacidade funcional significativa e mortalidade aumentada. Estes comportamentos coexistem frequentemente; no entanto, pouco se sabe sobre a sua co-ocorrência e como os indivíduos com ambas as perturbações diferem daqueles envolvidos em apenas um dos comportamentos.

Objetivos: Rever a literatura existente sobre a ocorrência de comportamentos auto-lesivos não suicidários em indivíduos com PCAs, por forma a esclarecer possíveis sobreposições entre as duas perturbações no que toca a epidemiologia, fatores de risco, etiologia, e motivações para os comportamentos, e explorar uma possível influência dos comportamentos auto-lesivos não suicidários na evolução da PCA. A abordagem de indivíduos com PCA e comportamentos auto-lesivos não suicidários será também brevemente discutida.

Métodos: A maioria dos artigos foram selecionados a partir do PubMed e ScienceDirect. Os autores foram contactados com o objetivo de obter acesso aos artigos não gratuitos. Os artigos usados que não foram encontrados na pesquisa inicial foram obtidos através de *back-search* de referências dos artigos selecionados ou foram enviados voluntariamente pelos autores contactados. Foram incluídos artigos de Janeiro de 2004 a Dezembro de 2021. Foram excluídas revisões bibliográficas, relatórios de caso, e publicações de caráter editorial. Os artigos foram selecionados de acordo com o título e resumo. Seguiu-se uma leitura completa do texto.

Resultados: 71 publicações foram incluídas nesta revisão. Os artigos usados incluem indivíduos com diagnósticos de PCA diversas, indivíduos sem diagnóstico de PCA mas com sintomatologia característica de PCA e/ou indivíduos com comportamentos auto-lesivos não suicidários. A maioria dos artigos estudados são relativos a características clínicas e funções dos comportamentos alimentares e auto-lesivos não suicidários. A disponibilidade de estudos longitudinais é limitada, o que se traduziu numa escassez de informação relativa aos fatores de risco e à evolução a longo prazo das perturbações.

Discussão: A forte relação previamente estabelecida entre estas perturbações é apoiada por várias semelhanças no que concerne a epidemiologia, etiologia e fatores de risco. Certas comorbilidades psiquiátricas são também frequentes em ambas as perturbações, com ênfase para a afetividade negativa. A presença de comportamentos alimentares anormais e comportamentos auto-lesivos não suicidários poderá funcionar como um mecanismo para diminuir a intensidade dos sintomas depressivos e providenciar uma sensação de alívio ao indivíduo. Além de possivelmente prever uma pior sintomatologia da PCA, a presença de comportamentos auto-lesivos não suicidários está fortemente associada a um risco acrescido de tentativas de suicídio, especialmente em indivíduos com outras perturbações psiquiátricas.

Conclusão: Apesar da sua crescente relevância clínica, a investigação sobre co-ocorrência de PCAs e comportamentos auto-lesivos não suicidários é ainda claramente insuficiente. É então necessária a realização de estudos longitudinais para melhor compreender o desenvolvimento a longo prazo e as implicações da co-ocorrência das duas perturbações, bem como para explorar novas abordagens especificamente orientadas para os doentes com PCAs e comportamentos auto-lesivos não suicidários em simultâneo.

Palavras-chave: comportamentos auto-lesivos não suicidários, perturbações do comportamento alimentar, anorexia nervosa, bulimia nervosa, perturbação de compulsão alimentar, suicídio.

List of abbreviations:

ED - Feeding and Eating Disorder

NSSI - Non-suicidal self-injury

AN - Anorexia Nervosa

AN-R – Anorexia Nervosa Restricting type

AN-BP – Anorexia Nervosa Binge/Purge type

BN - Bulimia Nervosa

BED - Binge eating disorder

OSFED - Otherwise specified eating disorder

EDNOS - Eating disorder non-otherwise specified

BPD – Borderline Personality Disorder

DE - Disordered eating

SA - Suicide attempt

QoL – Quality of Life

SBD – Suicidal behavior disorder

STB – Suicidal thoughts and behaviors

IPTS – Interpersonal Psychological Theory of Suicide

DBT - Dialectical-behavioral therapy

CBT - Cognitive-behavioral therapy

TAU – Treatment as usual

CDP – Cutting down programme

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Introduction

Feeding and Eating Disorders (EDs) and the behaviors that characterize them, as well as *Non-Suicidal Self-Injury* (NSSI), are considered forms of self-harm. However, whereas EDs are classified as indirectly self-harming behaviors, NSSI is considered to be a direct self-harming behavior [1].

EDs are characterized by a persistent disturbance of eating or eating-related behavior that results in the altered consumption or absorption of food and that significantly impairs physical health and/or psychosocial functioning [2]. EDs usually start during adolescence (12-15 years old) [3, 4], with increased risk occurring from middle adolescence into young adulthood [5]; however, the ages of onset differ between adult and adolescent samples, with the latter having younger ages at presentation [3]. Although any eating disorder can be present in males, it is still far more prevalent in females [6]. A clinical eating disorder is frequently preceded by disordered eating symptoms (e.g. *weight preoccupation*, *body dissatisfaction*, *binge eating*, and *compensatory behavior*) and although both behavioral and cognitive symptoms of EDs develop and present mostly during adolescence, they often persist into adulthood [5].

Anorexia nervosa (AN) is characterized by a persistent energy intake restriction leading to significantly low weight (usually a BMI less than 17,0 kg/m²), associated with an intense fear of gaining weight or becoming fat that is not alleviated by weight loss and a disturbance in self-perceived weight and/or shape [2]. Although these characteristics are present in all individuals who are formally diagnosed with AN, this disorder is divided into two distinct subtypes, namely a *Restricting type* (AN-R) and a *Binge-eating/purging type* (AN-BP). Similar to AN, *Bulimia nervosa* (BN) has three essential features: recurrent episodes of binge eating which are accompanied by compensatory behaviors (referred to as *purge behaviors*) to prevent weight gain, and a disproportionate valorization of body shape and weight in self-evaluation [2]. As the name suggests, *Binge-eating disorder* (BED) is defined by recurrent binge-eating episodes, provided these occur at least once per week for 3 months and are accompanied by a sense of lack of control [2]. Some of the reviewed articles also included EDs that fall in the Diagnostic and Statistical Manual of Mental Disorders 5th Edition (DSM-5) categories *Otherwise Specified Feeding and Eating Disorders* (OSFED) and *Eating Disorders Non-otherwise Specified* (EDNOS). The former includes disorders such as atypical AN (which meets all the criteria for AN, except for weight under the normal range), BN of low frequency and/or limited duration, BED of low frequency and/or limited duration (both disorders meet most of BN and BED's criteria, respectively, but the disordered behaviors occur less than once a week and/or for less than 3 months), purging disorder (recurrent purging behavior without binge-eating) and night eating syndrome [2]. The category EDNOS includes presentations that do not meet the full criteria for any of the disorders in the feeding and eating disorders class, although symptoms characteristic of these disorders are present and cause clinically significant distress and impairment in social, occupational, and other areas of functioning [2].

The severity and impact of EDs are widely demonstrated through elevated levels of role impairment (particularly social impairment in patients with AN), medical complications, comorbidity, mortality, and suicide. According to Swanson et al., who studied a group of adolescents with EDs, lifetime suicidality is associated with all types of EDs, particularly with BN [3].

Even though Non-Suicidal Self-Injury (NSSI) is a condition that warrants further study and demands better characterization, its clinical importance is increasing, especially considering its frequent association with a range of other psychiatric disorders [7]. NSSI is a form of direct self-harm that most often starts in the early teenage years and its essential feature is the recurrent, repeated, and deliberate destruction of one's body tissue without the intention to die, which usually translates into the infliction of shallow, yet painful, injuries to the surface of one's body [2, 8–10]. Cutting is the most frequently used method for self-injuring and the objects used to inflict the injury are many: knives, needles, razors, or any other sharp object [2, 9]. Other methods include stabbing, scratching, biting, banging, hair pulling, and inflicting superficial burns (the latter being the least frequent, but most severe) [2, 7, 11]. When evaluating an individual with NSSI, it is of the utmost importance to uncover if they engage in multiple self-injuring methods, as this is frequently associated with more severe psychopathology [2]. This use of more diverse NSSI methods, as well as NSSI frequency and NSSI-related hospital visits, is associated with an early age of onset of NSSI [8].

In a study conducted on Dutch-speaking adolescents and emerging adults [8], about 21% of the participants reported engaging in at least one episode of NSSI by the age of 25 years old. This study also showed that the probability of first NSSI episode increased significantly after 9 years old, reaching a peak by the age of 14-15 years old. Although the peak in the age of onset occurred in the same period for both male and female adolescents, females presented a higher probability of engaging in at least one episode of

NSSI when compared to males in this age group. The age of onset is also influenced by psychiatric disorders such as borderline personality disorder (BPD) and EDs. The prevalence of NSSI is generally known to be higher in individuals with psychiatric disorders; however, it is especially elevated in those suffering from the aforementioned disorders (BPD and/or ED) [8, 9].

Although not much is yet known about the co-occurrence of EDs and NSSI, the clinical relevance of the theme is rapidly growing. The evidence available points to a strong link between the two entities, that is supported by overlapping characteristics regarding epidemiology, etiology, and mechanisms, and by differences found between individuals with EDs only and individuals with ED and comorbid NSSI regarding disease course [7, 12].

Purpose of review

Considering the above mentioned, the present work aims to review the existing literature regarding the occurrence of NSSI among ED patients, addressing putative risk factors, mechanisms, and characteristics common to both disorders, as well as how the natural history of the primary disorder (i.e., the ED) might be influenced by the presence of NSSI. Management of comorbid ED and NSSI will also be briefly discussed, although research regarding this specific condition is still very preliminary.

Methods

Most articles featured in the present narrative review were selected through a meticulous search in two distinct databases – PubMed and Science Direct – using the following MeSH terms: Feeding and Eating Disorder, Non-suicidal self-injury, Anorexia nervosa, Bulimia nervosa, Binge eating disorder, and Suicide. Articles were first selected according to title and abstract. This was followed by a careful full-text read that further narrowed the results. Inclusion criteria dictated that selected articles be written in English, published between January 2004 and December 2021, and focus on populations with a diagnosis of an Eating Disorder or disordered eating behaviors and/or non-suicidal self-injurious behaviors. Both freely and not freely accessible articles were included, the latter being obtained via e-mail to the corresponding authors. Only articles regarding adolescents and adults were included, i.e., papers that included individuals under the age of 10 were excluded (as defined by the World Health Organization, that considers adolescents to be those individuals between the ages of 10 and 19). Narrative reviews, case series, case reports and editorial publications were also excluded. The articles that did not arise from the original search were found through a back-search of some of the previously selected articles' references and a minority of them were voluntarily sent by the contacted corresponding authors. The Zotero software was used to aid the back-search and to prevent the inclusion of duplicated articles.

Results

265 articles were retrieved from the initial search on PubMed and Science Direct. 35 extra articles were either obtained via back-search or voluntarily sent by the respective authors. After eliminating duplicates (n=28), 272 articles were left. A large portion of these articles (n=169) was excluded after reading the abstract, either because they were not in accordance with inclusion criteria or because they were not directly related to the theme and purpose of this review. Although authors of not freely accessible articles were contacted, 17 of the initially retrieved articles were eventually excluded due to lack of response from the authors. Furthermore, narrative reviews (n=4), publications of editorial character (n=2), and case reports (n=2) were also excluded. After reading the full text of the remaining 78 articles, 7 of these articles were excluded because they were not in line with the purpose of the present review. Therefore, 71 publications were included in this review.

Most articles were based on self-report measures and included individuals with a clinical diagnosis of AN, BN, BED, EDNOS, and OSFED or individuals who did not have a formal diagnosis of an ED, but engaged in disordered eating behaviors, and/or individuals who engaged in NSSI. The age interval of the individuals included in the articles was wide, but no individuals were under the age of 10 years old or above the age of 77 years old. The reviewed articles were conducted by research teams from Italy, Belgium, UK, Taiwan, Spain, USA, Sweden, Czech Republic, Korea, Portugal, Israel, Canada, Russia, Finland, Australia and Germany.

Discussion

Although eating disorders and NSSI are both important health problems that associate with significant functional impairment and mortality amongst young people [13], epidemiological data on the occurrence of NSSI in the context of EDs has, so far, been scarce, which translates into an absence of a clear estimate of its prevalence. However, the available evidence suggests a strong link between NSSI and EDs [12], supported by several established similarities in epidemiology, underlying mechanisms, and correlations between the two entities [7, 13]. NSSI occurs at higher rates in samples diagnosed with EDs when compared to the general population, and the prevalence of EDs is also higher among NSSI samples than in non-clinical populations [6]. As is observed in the general population of self-injurers, cutting is the most prevalent NSSI method in ED patients [14, 15]. Claes and Muehlenkamp found that the rates of NSSI in patients with EDs varied from 25% to 55% [1]. Similarly, in a recent meta-analysis, Cucchini et al. found that approximately 28% of individuals diagnosed with an ED reported a history of NSSI, with higher prevalence estimates for individuals diagnosed with BN (32,7%) when compared to AN (27,3%) [7].

The distinction between restrictive and binge-eating/purging patients regarding the presence of NSSI is yet to be clarified, considering that some previous research work has concluded that NSSI is more prevalent in patients who engage in binge-eating/purging behaviors [9, 11, 16, 17], whereas others found no significant difference between these individuals and the ones who are mainly restrictive [4, 18, 19]. Regarding the patients' weight, while some research works have found no association between self-injurious behavior and BMI [18], others have found BMI to be higher in patients who engage in NSSI [9, 16, 20] and others still have found a positive association between self-harm and lower BMI [10].

Co-occurrence of direct self-harm and *disordered eating* (DE) is also common in non-clinical samples consisting of participants with DE behaviors but without a formal diagnosis of an eating disorder: a longitudinal study carried out in a non-clinical sample in the UK showed that the prevalence of direct self-harm was higher in those reporting any disordered eating behavior, both at the age of 16 and 24 years old when compared to those who did not engage in these behaviors, and it also concluded that the prevalence of direct self-harm among people with disordered eating behavior decreased from the age of 16 to 24 [13]. In another longitudinal study, individuals in a non-clinical, untreated sample were evaluated every three months for 1 year. Findings showed that, at any given time point, an increase in NSSI frequency was associated with more severe DE and vice-versa [21].

Why does NSSI occur among patients with eating disorders?

Shared functions

In their explanatory model, Nock and Prinstein [22] specified four main functions of NSSI behavior, which are based on *positive and negative reinforcement*: *automatic negative reinforcement* (to stop unpleasant emotions), *automatic positive reinforcement* (to create an emotion that replaces dissociation, e.g., an anti-dissociation function or to create a sensation of relief), *social negative reinforcement* (to avoid an unwanted situation) and *social positive reinforcement* (as a way to ask for help or get attention from others) [11, 15, 18].

In line with Nock and Prinstein's work, more recent research has found two main explanations for why one would engage in NSSI, one of them being associated with *intrapersonal functions* and the other with *interpersonal functions*. The intrapersonal functions represent an attempt to regulate and manage distressing internal states, whereas the interpersonal functions represent social functions, both acquiring an important coping mechanism for the subject [11, 16]. In general, these functions are highly stable within individuals across time, which means that the reasons that lead one to partake in these behaviors will likely stay relatively similar across time, regardless of treatment status [23]. Although ED patients engage in NSSI for both purposes, *the intrapersonal or self-regulatory functions* are prominent, particularly the emotion and affect regulation function (mostly heightened negative affect) and the self-punishment function [11, 15, 16, 23, 24]. On the other hand, it is possible that higher affective variability, especially regarding activation (high vs. low) also plays a role in the occurrence of lifetime NSSI. This possibility supports the evidence that NSSI has, in fact, an affect-regulation function [25]. In patients with EDs, NSSI could even serve real-time emotion regulation functions, as patients report an increase in high activation negative affect (anger and anxiety) and a decrease in positive affect shortly before engaging in NSSI followed by an immediate increase in positive low arousal affect and a decrease in anger and anxiety [15] after injuring themselves, which is perceived by the individuals as a feeling of relief [15, 26]. However, the high level of residual negative affect that remains after NSSI and the increase in positive affect contribute to the maintenance of this behavior [26]. Some patients with BN and NSSI report a similar affect trajectory when describing behaviors such as binge-eating and purging, which means that, in these patients, NSSI could be

an indicator of growing decompensation of the primary illness (i.e., the ED) such that ED behaviors are no longer enough for regulating aversive emotions, and therefore patients have to resort to additional self-harming behaviors [26].

Even if to a lesser extent, other intrapersonal functions (anti-dissociation, managing distress, and anti-suicide, as well as interpersonal functions (establishing interpersonal boundaries), have also been found in individuals who engage in NSSI [11]. Additionally, it has been found that participating in non-suicidal self-injurious behaviors is not associated with suicidal ideation, which may be consistent with the idea of NSSI as a functionality of an emotion regulation strategy [18]. Curiously enough, in a pathological population characterized by numerous thoughts and behaviors that are riskier than NSSI (e.g., suicidal ideation and suicide attempts), this form of self-harm could serve a protective role, by replacing more dangerous behaviors. This protective function is supported by studies showing that ED patients engaging in NSSI present higher levels of *loss aversion*, a measurement that reflects human beings' natural tendency to be driven by avoidance of losses [20, 27]. For individuals in need of immediate affect regulation, a tendency toward loss aversion may protect them from opting for a more dangerous behavior (e.g., Suicide attempts (SA)), while motivating them toward an act that externalizes, expresses, and communicates their pain (e.g. NSSI) [27].

Although ED functions have not been as extensively studied as NSSI's, it appears that ED behaviors also serve as emotion regulators by providing a way to feel a sense of control over one's body, emotions, and cognitive states. One study, in particular, found that emotion dysregulation, although related to ED behaviors and cognitions, has a stronger association with the latter than with the former across the full spectrum of EDs, i.e., emotion regulation concerns (difficulties with identifying and understanding emotional states and problems selecting adaptive over maladaptive emotion regulation strategies) are strongly related to cognitive-oriented ED symptoms when compared to behaviors such as binge eating, restrictive eating, or purging. This could reflect that patients who engage in high levels of ED behaviors, regardless of ED type, may have found a way to effectively, though maladaptively, regulate aversive emotions through these ED behaviors, thus reducing negative affect and emotion dysregulation [28]. Somehow similarly to these findings, another study found that the two behaviors might serve independent purposes, with NSSI's functions associating more strongly with negative affect and therefore focusing more on intrapersonal functions (e.g. affect regulation, anti-dissociation, and marking distress), while the functions more relevant to ED behaviors broadly fell into the interpersonal domain (interpersonal boundaries, peer bonding, and autonomy) instead of assuming a regulating function [29, 30]. This could point to a dominance of emotional regulation and intense negative affect as drivers for NSSI, even among patients with primary EDs [30]. It could also suggest that, when elevated levels of depression are observed alongside emotion dysregulation and body dissatisfaction (which is closely related to EDs), the likelihood of NSSI and ED co-occurring increases greatly [30].

Essentially, both NSSI and ED behaviors represent maladaptive mechanisms that individuals who lack adequate coping strategies endorse as an attempt to impulsively reduce negative emotions [16, 31].

Shared Etiology and Characteristics

EDs and NSSI have many phenomenological similarities, which could explain why individuals with EDs present an increased risk of engaging in this self-injurious behavior when compared to healthy populations [18]. The two behaviors have a similar age of onset (usually during adolescence or early adulthood), greater prevalence among women [9], and similar psychiatric comorbidities (depression, anxiety, suicidality, and/or substance abuse) [7, 12]. Moreover, EDs and NSSI might be determined by similar interpersonal distal factors, such as family environment/dynamics and a history of traumatic childhood experiences [1]. These self-harming behaviors are also proposed to share a variety of neurobiological and psychosocial characteristics, including high intensity of *negative affect*, *impulsivity*, *perfectionism*, *obsessive-compulsive characteristics*, *cognitive distortions* about oneself and one's physical image (*body dissatisfaction*), *low body regard*, *dissociation*, and *an intense need for control*; when combined with emotion or affect dysregulation, these characteristics greatly increase the risk of developing both NSSI and EDs [1, 6]. It must be noted, however, that the great majority of the published research is cross-sectional, making it yet impossible to determine the causal relationship of these factors with the development of NSSI in ED patients.

In their research, Vieira et al. [10] studied possible risk factors for the occurrence of NSSI in an ED population, aggregating them into distal risk factors (e.g. family environment and traumatic experiences) [32] and proximal risk factors. Regarding distal risk factors, the study found that *parental low weight and eating concerns* (e.g. tension at mealtime), as well as *quality of parenting and parental psychopathology*, might be related to future onset of NSSI in ED patients. A study by Claes et al. also found that perceived parental criticism might indirectly predict NSSI in adolescents with EDs, via evaluative

concerns perfectionism (a maladaptive dimension of perfectionism) [33]. *Traumatic childhood experiences*, such as physical, sexual, and/or emotional abuse, were also associated with future onset of EDs and comorbid NSSI [10, 34, 35]. When discussing proximal risk factors, Vieira et al. found an association between the onset of ED and NSSI and *negative self-evaluation, substance abuse* [36], and, in line with other research, *previous SAs* [7, 36]. *Recent bereavement or other stressful life events* that increase internal distress, and a *younger age of onset of ED symptomatology* were also associated with an increased risk of engaging in other maladaptive behaviors, such as NSSI [10, 37]. In line with other research [9, 11, 16, 17, 27, 36], NSSI was found to be more prevalent in *binge-eating/purging* patients, which could lead one to interpret these behaviors as possible risk factors for future onset of NSSI. Further studies conducted by Vieira et al [37] showed that distal risk factors might be indirectly associated with NSSI through proximal risk factors. For example, negative self-evaluation, substance abuse, and SA (as a symptom of severe depression) might mediate the relationship between past sexual and/or physical abuse and NSSI in ED patients. *Negative feelings and attitudes towards the body*, which are extremely frequent in patients with EDs, can be predictors of both non-suicidal and suicidal self-injury, considering that a lack of regard for one's body might lead to feelings of dissociation or detachment toward it which would explain the self-injurious behaviors [11, 14]. This rationale could also explain the fact that a history of previous suicide attempts possibly represents a risk factor for NSSI engagement in ED patients [7, 10].

In agreement with Vieira et al.'s findings, other studies focused on adolescents with EDs have found that factors such as associated psychopathology (e.g., mood disorders), intense self-criticism, having experienced negative events during their childhood and substance abuse increase the risk of engaging in self-injurious behaviors [2, 7, 9, 18, 38].

Negative affectivity, usually manifested by the presence of depression and/or anxiety symptoms, is quite common in both ED patients and individuals with NSSI [1]. Even though these symptoms are more strongly predictive of NSSI than ED behaviors [30], individuals with high intensity of negative affect, e.g. individuals who suffer from a depressive or anxiety disorder, probably have an increased risk of developing both diseases [30, 36, 38]. As previously discussed, *emotion and affect regulation* are prominent functions of NSSI in ED patients [11, 16, 18, 39]. These patients often present difficulties regulating emotional states (especially negative high arousal emotions), struggling to accept and manage distressing feelings, and to engage in goal-directed behaviors when experiencing these feelings (i.e. when upset, they struggle to concentrate and complete tasks) [30, 40, 41]. One longitudinal study found that individuals with both disorders had heightened *emotional reactivity* at baseline and follow-up, i.e., ED patients with NSSI could be predisposed to experience negative emotions as more aversive and intolerable [42]. When combined with difficulties in regulating emotional states, and in the absence of adaptive coping strategies, emotional reactivity greatly increases the chance of these individuals resorting to maladaptive coping behaviors, such as disordered eating or NSSI, as a means of rapidly regulating intense aversive affect [21, 40].

Impulsivity - a range of cognitive and behavioral responses to stimuli without forethought or regard for consequences - is very often found in patients with EDs and individuals with heightened negative affectivity and emotional reactivity [42]. This leads them to engage in unplanned perjurious behaviors as a response to these aversive emotions, with direct self-injury being one of the most common behaviors, as well as excessive spending and stealing [39]. Indeed, various dimensions of impulsivity are thought to be higher in ED individuals who engage in NSSI when compared to those who do not [41, 43–45]. ED patients who engage in NSSI also tend to exhibit more impulsive behaviors when compared to those who present solely with eating pathology, namely substance abuse disorders and impulse-control disorders [46]. Cucchi et al. actually found substance abuse to be a significant predictor of NSSI among ED patients [7]. Some studies, however, found no significant difference between ED groups who engaged in NSSI and those who did not regarding impulsivity [40, 47].

Self-criticism, which is defined as a highly negative attitude toward the self and often considered a maladaptive emotion-regulation strategy, has recently been associated with NSSI, which probably means that this behavior serves as a self-punishing method for highly self-critical individuals and as a means of regulating negative affect (strongly linked to self-criticism) and communicating their distress to others [33]. Because self-criticism is extremely characteristic of individuals with EDs, these could be at an increased risk of engaging in NSSI when compared to healthy populations [33, 48, 49]; moreover, an association has indeed been found between the presence of high self-criticism and the onset of NSSI in patients with EDs [18, 33].

Interoceptive deficits, which refer to a decreased ability to sense and respond to the body's internal physiological sensations and to recognize emotions, have been associated with EDs and NSSI, with individuals who participate in both behaviors presenting higher deficits when compared to individuals who engage in only one of the behaviors [30, 50]. Not only do interoceptive deficits facilitate disconnection from one's body, but the inability to recognize emotions renders the individual incapable of accessing

adequate emotion regulation strategies, thus leading them to engage in maladaptive coping behaviors [50, 51].

Regarding the adolescent individual, Claes et al. [52] also take into consideration characteristics related to *the formation of identity* and the development of the self, suggesting that young individuals who present with ED and NSSI present greater identity confusion, difficulty in recognizing their wants, needs, and inner states of mind. Claes et al. also found a positive association between identity confusion and NSSI versatility. Gandhi et al., on the other hand, demonstrated that the association between identity disturbances and NSSI is stronger in ED patients than in patients who engage in NSSI only [8]. In these individuals, NSSI might serve as means to create a new sense of self, to avoid addressing identity-related exploration and commitment, and as a way of managing negative affect related to the aforementioned identity disturbances [8, 52].

In sum, the frequent combination of impulsivity and difficulties in regulating emotions may be related to the development of concurrent EDs and NSSI [10], especially in highly self-critical individuals who present increased negative affect and struggle to recognize and respond to emotions. And although these behaviors can be effective in attenuating intense aversive emotions, the subsequent relief is short-lived and both behaviors are often associated with long-term consequences, including psychological morbidity and suicide [41].

NSSI and ED type: binge-purge vs. restrictive behaviors

As previously discussed, and although some studies found no relation between ED type and NSSI, it is currently accepted that NSSI is more prevalent among ED patients who binge-purge than those who are exclusively restrictive. To support this assumption, several studies have concluded that, when compared to individuals with restrictive ED types, those with binge-eating/purging type EDs have higher rates of emotion dysregulation, impulsivity, and higher incidences of impulsive behaviors, including self-injurious behavior [2, 7, 11, 39, 43–45, 53]. However, it is important to note that this does not mean restriction confers no risk regarding NSSI, especially considering that restrictive eating is a transdiagnostic feature across different eating disorders and that patients who engage in binge-eating/purging behaviors often restrict, possibly in a more intense manner than restrictive-only ED patients [17], which means that restrictive eating might be a promoting factor for NSSI across ED diagnosis (including those characterized by binge-eating/purging behaviors) [53]. Besides, one study has concluded that individuals who engage in restrictive eating and NSSI simultaneously have much greater difficulties accessing and implementing effective, rather than impulsive, emotion regulation strategies [53].

How does NSSI influence eating disorders?

Eating disorders and self-injuring behaviors usually start during adolescence, often persisting into adulthood [5, 13]. However, the frequency and severity of these behaviors often stagnate or even decrease as time goes by [5, 13].

ED patients with comorbid NSSI usually present *more severe ED psychopathology* than individuals with ED that do not engage in other self-harming behaviors [10, 16, 18, 32, 36, 40, 42, 46] (as defined by more frequent use of diuretics and binge-purge episodes, number of previous treatments, and longer duration of illness by [46]). Furthermore, one study found an association between greater NSSI frequency and versatility (resorting to a larger number of methods) and the severity of ED symptomatology. This could indicate that more severe NSSI further increases the severity of primary ED [42] or, alternatively, that the need for NSSI is higher in more severely ill patients because they have greater difficulties in emotion regulation [32]. In a study conducted by Varela-Besteiro et al. [18], that compared ED adolescents with and without NSSI disorder, the NSSI group was found to present more severe ED, depression [16], and anxiety symptoms. Body image, particularly *body dissatisfaction*, which is one of the parameters considered when evaluating ED symptomatology, plays an important role in the development of NSSI in individuals with EDs. Pérez et al. [11] concluded that body image was significantly more affected in patients who reported past and present NSSI when compared to ED patients with no history of self-injurious behavior, indicating that an altered body perception and faulted body evaluation might be linked to NSSI engagement – both past and ongoing - in ED patients.

In addition to more severe ED psychopathology, ED patients with NSSI also present *higher general psychopathology* [16, 40], with one study showing a higher prevalence of past psychiatric hospitalizations in ED patients with NSSI when compared to those without [36]. Besides being putative risk factors for the development of NSSI in EDs, depressive disorder, and alcohol abuse disorder also have high comorbidity with NSSI in ED patients, appearing more frequently in individuals who engage in both behaviors than in those who don't engage in NSSI [36]. Other psychiatric comorbidities have been linked

to the presence of NSSI in ED patients, namely obsessive-compulsive symptoms and anxiety symptoms, which contribute to greater disease severity [36, 40].

The fact that individuals with NSSI have higher ED and general psychopathology explains why these patients report lower quality of life (QoL) and why the prognosis for individuals who engage in both behaviors is probably worse than for ED-only patients [42, 43]. Even after adjusting for QoL at admission, patients with ED only attain better QoL at the end of treatment, when compared to patients with co-occurring behaviors, which suggests that NSSI could be a complicating factor in the treatment of other comorbid conditions, in this case, EDs [42].

Does NSSI influence suicide risk in ED patients?

Even though suicidal behavior disorder is one of the main differential diagnoses for NSSI behavior disorder, there is a fundamental difference between the two entities: while in the first disorder the stated goal is a wish to die, in the second one, the goal is, as previously discussed, to experience relief. In fact, according to DSM-5, NSSI and Suicidal Behavior Disorder (SBD) can co-exist in the same person, but one self-injurious behavior can only either be defined as NSSI or SBD. Nonetheless, there is an increased risk for suicidal behavior in individuals who engage in NSSI, and suicide attempts do occur more frequently in these individuals, especially for those who resort to multiple self-harming methods [2, 9, 12, 54–58]. Moreover, a study focused on adolescent self-injurers concluded that all adolescents with NSSI had a history of suicide ideation and that most of the patients with previous SAs reported a history of combined NSSI, suicide ideation, and suicide plans [56], which suggests there are some overlapping characteristics between one behavior and the other [59].

One study found that the prevalence of SA was more than seven times higher in patients with a history of NSSI [60]. Another study concluded that depressed adolescents with EDs had a five-to-six-times higher risk of suicidal ideation. Although overall EDs were not associated with an increased risk of future SAs, the presence of other self-injurious behaviors in these patients, such as NSSI and laxative use, could be an early sign of suicide ideation and, therefore, require further evaluation to prevent future onset of SAs [61]. Behaviors such as laxative use and NSSI have also been found to mediate the relationship between AN-BP and extreme suicidal behaviors [62].

Stewart et al. further investigated the influence of other risky behaviors on the onset of suicidal behaviors among patients who engage in NSSI, finding that patients who engaged in more risky behaviors, such as substance abuse or disordered eating or even a wider variety of NSSI methods, were more prone to develop Suicidal thoughts and behaviors (STB) [54], which is compatible with findings from Selby et al and Turner et al. [55, 62]. Contrary to versatility, this study found no association between suicidal behaviors and frequency of NSSI engagement [54], which is compatible with findings from some authors [55], but in contradiction with others [57]. The idea that NSSI versatility, frequency, and severity are associated with higher suicide risk [54, 55, 57] is consistent with the *Interpersonal Psychological Theory of Suicide* (IPTs) [63], which proposes that, for suicide to occur, three factors must be present: 1) feelings of perceived burdensomeness; 2) a sense of thwarted belongingness and 3) an acquired capability to enact lethal self-injury, which, in turn, requires the presence of fearlessness about death and tolerance to pain. Capability is believed to be acquired through repeated engagement in or exposure to behaviors that involve physical pain, whether it be direct self-injury (e.g., NSSI) or indirect self-injury with a high potential for physical harm (e.g. DE) [16, 55, 64]. Therefore, in this model, both ED behaviors and NSSI can represent a risk factor for subsequent suicide attempts, especially if the individual uses multiple self-harming methods [56]. Research suggests that NSSI could be indirectly associated with SA through pain tolerance [51] and that individuals with both NSSI and DE report fewer reservations and fear about suicide [64]. It is also possible that a growing sense of capability for self-harm decreases levels of loss aversion and leads the individual to choose more lethal behaviors than before [27]. In the same vein, one study found that people who reported suicidal ideation and suicide plans were more likely to attempt suicide if they had previously engaged in NSSI, and those who transitioned to SA after NSSI were more likely to report a history of cutting, which is the primary NSSI method used by patients with EDs [57]. Selby et al. also found that AN-BP patients tend to endorse more suicidal behaviors than their AN-R counterparts; if considering that AN-BP patients engage in more painful and provocative behaviors than AN-R patients (bingeing, purging, and, according to some authors, NSSI), this higher prevalence of suicidal behaviors would also be compatible with the IPTs [62]. It is possible that a larger diversity of self-destructive behaviors, in this case, NSSI and ED behaviors, allows individuals to habituate to a range of painful experiences, further preparing them to enact potentially fatal self-harm. On the other hand, one study concluded that, contrary to NSSI versatility, DE versatility has no influence on suicide risk amongst patients who engage in both NSSI and DE. Furthermore, no difference in suicide risk was found in NSSI+DE patients when compared to patients who only engaged in NSSI [55], which might suggest that suicide risk in ED patients who engage in NSSI is more strongly influenced by the presence of direct self-injury than by the ED itself. Contradicting these

findings, Brausch and Perkins concluded SA severity to be higher in patients who reported both DE and NSSI when compared to individuals with NSSI only [64]. However, their research found no differences between the DE group and the healthy control group regarding suicide risk, which could strengthen the hypothesis that DE behavior itself might not be strongly associated with suicide risk and this may be primarily driven by NSSI in patients who engage in both behaviors [64].

Stewart et al. also found some important differentiating factors between adolescent self-injurers with no suicidal behaviors and adolescent self-injurers with suicidal ideation and/or a history of suicide attempts [54]. Adolescents with suicidal ideation showed higher rates of depression, with hopelessness and helplessness presenting a closer association with suicide ideation when compared to other symptoms of depression. However, the association between depression and SAs among ideators was weak. On the other hand, certain external factors linked to the composition of depression, such as low social support, could explain the elevation in STB in some NSSI patients. Finally, Stewart et al. also found that a younger age of NSSI onset was associated with future SAs [54]. Contrary to Stewart et al., Turner et al. found that the interaction of NSSI versatility and depression accounted for significant variability in suicide risk at three months follow up, i.e., individuals who presented greater NSSI versatility and who experienced greater depression had higher risk of suicide at follow up; moreover, those who engaged in multiple NSSI methods but did not present higher negative affect (in the form of depression) did not have a significantly higher suicide risk, which strengthens the hypothesis that depression does have a role in the transition from NSSI to SAs [55]. This is relevant for the subject matter, given that patients with EDs often report high negative affect, commonly in the form of depressive disorders.

In sum, it appears that engaging in multiple forms of direct and indirect self-injury is associated with greater suicide risk, especially in patients who suffer from disorders with increased negative affectivity [55, 64].

Therapeutic approach

Considering the high prevalence of NSSI among individuals with EDs and especially its positive correlation with suicide attempts, the treatment, and prevention of self-injurious behaviors in ED patients should be a priority for researchers and clinicians. Nonetheless, self-injurious behaviors are still largely overlooked in routine psychopathological examinations and NSSI screening is mainly focused on patients who have had disease for a longer period (particularly if diagnosed with BN) or who present other risky behaviors (e.g. binge-eating/purging behaviors, substance use, history of abuse) [9, 18]. Although data regarding a targeted approach for these individuals is sparse, structured psychotherapeutic approaches focusing on collaborative therapeutic relationships, motivation for change, and family/individual skills training seem to be most effective in reducing NSSI [7]. The efficacy of psychotherapy has been proven by Kaess et al. [65], who concluded that, regardless of the type of treatment used, outpatient psychotherapy was efficacious in decreasing NSSI frequency, SAs, and depression symptoms as well as improving QoL.

Affective and emotional regulation are, evidently, central aspects in the development of self-injurious behavior. Moreover, ED patients with NSSI are less responsive to inpatient treatment, probably because a history of self-harm among these patients is associated with less change in negative affect during treatment and, consequently, with a decrease in motivation and compliance to therapy [66]. Therefore, therapy should focus not only on reducing negative affect but also on stabilizing affective states [25]. When treating an ED patient, regardless of the ED subtype, clinicians should search for the presence of difficulties in emotion regulation and try to understand the strategies the patient uses to cope with these difficulties [28]. Treatments should include the use of adaptive coping behaviors [28, 32], leaning on emotion-based therapies, such as Dialectical Behavior Therapy (DBT) and Cognitive Behavioral Therapy (CBT) to teach and provide patients with healthy strategies for expressing and managing their thoughts and feelings [11, 35, 40, 67]. Ougrin et al. [68], who reviewed an extensive list of therapeutic interventions for self-injuring adolescents, concluded that DBT, CBT, and Mentalization-based Therapy were the most efficient at reducing NSSI behaviors.

DBT was originally developed to treat NSSI in the context of Borderline Personality Disorder, but it has since been successfully adapted to address a broader spectrum of conditions involving emotion dysregulation and mal-adaptive coping behaviors, including EDs (especially those belonging to the B/P spectrum) and NSSI in other contexts besides BPD [35, 69]. One study comparing DBT with Treatment as Usual (TAU) in an acute care unit for adolescents with various disorders found that implementation of DBT significantly decreased incidents of self-injury in the unit and the number of days in the hospital, proving DBT to be both clinically and financially appealing for the treatment of adolescents with psychiatric conditions who engage in NSSI [69].

CBT is also very useful in patients suffering from EDs and/or NSSI since it directly targets difficulties in emotion regulation and problem-solving by understanding the triggers preceding self-harming behaviors and teaching alternative strategies. However, CBT approaches self-harm and suicidal

behaviors as symptoms of an underlying condition and not as the condition itself [70]. On the contrary, Brief Cognitive Behavioral Therapy, a therapy that incorporates elements from both CBT and DBT, views self-harming behavior as the primary target of treatment and it has achieved positive results in young patients with NSSI or other forms of self-harm, even in those experiencing intense negative affect and/or suicidal thoughts [70]. Kaess et al., who experimented with the manualized Cutting Down Programme (CDP, a manual-assisted therapy for adolescents that incorporates elements from DBT and CBT) found that, although CDP was equally as efficient as TAU, patients being treated with CDP showed a faster reduction in the frequency of NSSI and, therefore, required fewer therapy sessions; they also found CDP to be effective in reducing adolescent NSSI in the context of a large spectrum of psychiatric comorbid disorders [65].

Treatment adherence is often not as great as expected in patients with NSSI. In their pilot trial, Bjureberg et al. [71] proved that online emotion regulation therapy might be more efficient than face-to-face therapy for adolescents with NSSI, probably because these disorders are frequently characterized by feelings of shame and a tendency to self-disclosure, which may decrease compliance to in-person therapy. Therefore, not only does it target an important disadvantage of traditional therapy, but this alternative also proves to be very useful in the pandemic context we have been living in for the last 2 years.

Conclusion

NSSI is extremely frequent in ED patients, thus representing one of the most relevant behaviors to be considered by clinicians when treating this specific population. Although it is generally accepted that individuals engage in both behaviors as a way of regulating intense negative affect and achieving a feeling of relief, research about this matter is still insufficient, especially regarding the evolution of the two disorders and how they influence each other's courses. The present review also demonstrates the importance of assessing and treating self-harming behaviors in patients diagnosed with EDs, given how they impact the individual's quality of life and the outcome of the disease. However, routine examination of ED patients (and other psychiatric patients) does not yet include NSSI screening and the existing research on targeted approaches for ED individuals with NSSI is still very scarce. In conclusion, further research about the subject matter is needed and it should include assessment methods that do not rely solely on self-report measures and longitudinal methods. This will hopefully allow clinicians to better understand the natural history of the co-occurrence of EDs and NSSI and to find specific treatments that better suit patients suffering from both disorders.

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