Non-suicidal self-injury (NSSI) is defined as the direct and deliberate destruction of one’s own body tissue in the absence of lethal intent. Following decades of progressive increase in the incidence of NSSI among adolescents and young adults, as well as growing scientific interest, the disorder was listed as a condition for further study in the Diagnostic and Statistical Manual of Mental Disorders (fifth edition). In this review we provide updated information on this phenomenon, focusing on: prevalence, course and prognosis; associated factors; its relationship with psychopathology; and the role of the mass media, social networks, and the internet. Finally, we discuss some conclusions and future proposals, emphasizing the need for collaborative work to better understand NSSI in Spain, and to improve prevention and treatment strategies.

Keywords: Non-suicidal self-injury, Self-harm, Suicide, Review

INTRODUCTION

Non-suicidal self-injury (NSSI) is a disconcerting and disturbing phenomenon that refers to any self-directed, intentional behavior carried out to cause immediate destruction of body tissue, but without suicidal intention. NSSI is different from behaviors involving accidental or indirect self-harm (e.g. food restriction, drug use), or that are socially accepted (e.g. tattooing, religious procedures).

In recent decades, there has been a growing interest in NSSI, both in scientific terms as well as in the mass media (see Trewavas et al. for a review). It is now considered a public health problem because it has increased in prevalence, and because recurrent NSSI can lead to multiple negative consequences such as physical injury, infection, hospitalization, and accidental death.

In 2013, NSSI was included as a new diagnostic category in the Diagnostic and Statistical Manual of Mental Disorders section III (disorders requiring further study; DSM-5), which represents an advance toward better understanding
and identification of this disorder. Future research will determine whether NSSI should be a definitive diagnosis in future versions of the DSM, and to that end, it will be necessary first to incorporate these new criteria into research and clinical practice (see Table 1), and second to create expert groups to drive collaborative research and progress in this area. Some examples of this, are the International Society for the Study of Self-Injury (ISSS, www.SSSweb.org), and the Self-harm Study and Treatment Group (Grupo de Estudio y Tratamiento de las Autolesiones; GRETA). The latter, is formed by authors of this review and aims to disseminate the relevance of NSSI in Spain.

In this review we provide a comprehensive summary of the existing literature on NSSI, without addressing treatment questions. This review contributes to update the available information on NSSI, focusing on prevalence, course and prognosis, associated factors, its relationship with psychopathology, and the role of the mass media, social networks, and the internet.

**BIBLIOGRAPHY SEARCH**

Using keywords related to NSSI (non-suicidal self-injury, self-harm, NSSI), we searched the Pubmed, Medline and Embase databases for articles published up to July 2017, and selected further relevant papers from the reference lists of the resulting studies. We then reviewed all of the resulting papers, and we summarize the evidence according to section topics shown below.

**PREVALENCE**

NSSI has historically been understood as an infrequent phenomenon, associated with the presence of some serious mental disorder. However, the current view is diametrically opposed, as we know that NSSI is neither rare, nor does it appear only in people with a mental disorder. In recent decades there has been an increase in its incidence in both children and adults. For instance, the first NSSI studies indicated a prevalence of 0.4% at the beginning of the 1980s, increasing to 0.75% by the end of the decade. Current reports indicate that approximately 4% of the general population has a history of NSSI. However, there is broad inconsistency in the reported prevalences of NSSI, which may be due to heterogeneity between the samples studied (e.g. clinical versus community samples), the assessment methods (e.g. self-report versus clinical interview), and the periods under study (e.g. any previous history versus episodes in the last year).

<table>
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<tr>
<th>Table 1</th>
<th>Proposed DSM-5 criteria for Non-suicidal Self-Injury</th>
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<tbody>
<tr>
<td><strong>A.</strong></td>
<td>In the last year, the individual has, on 5 or more days, engaged in intentional self-inflicted damage to the surface of his or her body of a sort that is likely to induce bleeding, bruising, or pain (e.g. cutting, burning, stabbing, hitting, excessive rubbing), with the expectation that the injury will only lead to minor or moderate physical harm (i.e. there is no suicidal intent)</td>
</tr>
</tbody>
</table>
| **B.**  | The individual engages in the self-injurious behavior with one or more of the following expectations:  
1. To obtain relief from a negative feeling or cognitive state  
2. To resolve an interpersonal difficulty  
3. To induce a state of positive feeling |
| **C.**  | The intentional self-injury is associated with at least one of the following:  
1. Interpersonal difficulties or negative feelings or thoughts, such as depression, anxiety, tension, anger, generalized distress, or self-criticism, occurring in the period immediately prior to the self-injurious act  
2. Prior to engaging in the act, a period of preoccupation with the intended behavior that is difficult to control  
3. Thinking about self-injury that occurs frequently, even if it is not acted upon |
| **D.**  | The behavior is not socially sanctioned (e.g. body piercing, tattooing, part of a religious or cultural ritual) and is not restricted to picking a scab or nail biting |
| **E.**  | The behavior or its consequences cause clinically significant distress or interference in interpersonal, academic, or other important functions |
| **F.**  | The behavior does not occur exclusively during psychotic episodes, delirium, substance intoxication, or substance withdrawal. In individuals with a neurodevelopmental disorder, the behavior is not part of a pattern of repetitive stereotypes. The behavior is not better explained by another mental disorder or medical condition (e.g. psychotic disorder, autism spectrum disorder, intellectual disability, Lesch-Nyhan syndrome, stereotypic movement disorder with self-injury, trichotillomania [hair-pulling disorder], excoriation [skin-picking] disorder) |
Childhood

NSSI is unusual in childhood, although it is frequently found in association with schizophrenia, Gilles de la Tourette or Lesch-Nyhan syndrome, or severe forms of mental retardation or autism. While there are no data on the incidence of NSSI below age 12 years, 5.1% to 24% of people who self-injure report that they had initiated this behavior before age 11-13.

Adolescents and young adults

NSSI is common among adolescents and young adults, although there is considerable inconsistency in results between studies, as we mentioned above. Studies with different samples from different parts of the world suggest that 13-45% of adolescents and 5-35% of young adults in the community have self-harmed at least once during their lives. In Europe, 27.6% of adolescents report having self-harmed at least once in their lives (with differences between countries: from 17.1% in Hungary to 38.7% in France), and 7.8% report recurrent NSSI. In a sample of 8,300 US university students (between 18 and 24 years old), 17% of individuals reported that they had self-harmed at least once in their lives, of whom 75% had done so recurrently. In Spain there is a lack of data on this issue. Recently, we reported a NSSI prevalence (> 5 events throughout life) of 32.7% in a sample of students aged 18-30 years. Of the young people who had self-harmed, 68% had committed at least one NSSI episode in the previous year.

To date, few studies have analyzed the prevalence of NSSI using the criteria proposed by the DSM-5. Zetterqvist et al. analyzed the prevalence in a sample of 3,060 adolescents aged 15-17 years and found that, while 35.6% had self-injured at least once in the previous year, only 6.7% met the DSM-5diagnostic criteria for NSSI.

NSSI is more prevalent in clinical samples. For example, 40-60% of adolescents admitted to psychiatric units report having engaged in at least one NSSI episode during their lives, and 50% report recurrent NSSI. In Spain, in a sample of 267 adolescents (11-18 years) undergoing outpatient treatment, 21.7% reported NSSI at least once in their lives. This high prevalence in the clinical population may be due to at least two factors. First, NSSI occurs in the context of a psychopathological disorder, and second, NSSI is ‘contagious’ in clinical contexts (especially in the hospitalization setting).

Adults

There have been very few studies in adults, including the elderly. In a community sample of 439 adults aged 19-92 years, Klonsky reported that 5.9% of individuals had a history of NSSI at any time in their lives, and 0.9% in the previous 12 months. According to the DSM-5 criteria for NSSI, the prevalence of NSSI in a sample of 2,509 adult Germans (mean age 48.8 years) was 0.3% (3.1% reported self-injury at least once in their life).

These data show that the prevalence of NSSI declines significantly in adulthood (especially from age 29 years onwards), which is consistent with the idea of an increase in this type of behavior in recent decades. This observation may also be due to memory bias among adults (forgetting that NSSI had occurred). Finally, studying NSSI in individuals with a broad age range (e.g. 19-92 years), including young adults, may offer a biased image of the prevalence of NSSI in adults.

COURSE AND PROGNOSIS

NSSI usually begins during adolescence, between 12 and 16 years. Therefore, adolescence is a period of particular vulnerability to NSSI, probably because of adolescents’ impulsiveness and emotional reactivity associated with brain development.

Specific risk factors for NSSI include previous history of NSSI, the presence of cluster B personality traits (DSM), and hopelessness. In addition, self-harm that occurs frequently and using different methods is a predictor of NSSI in the following year.

Longitudinal studies on the natural course of NSSI suggest that, in a significant portion of adolescents, NSSI constitutes a stable behavior that persists over time and that is associated with marked functional deterioration. One of these studies shows that 63% of self-injurers continue to do so one year after started NSSI. However, the course of NSSI is heterogeneous, and different factors may explain why some individuals commit NSSI occasionally while others do so recurrently.

One of these factors is the characteristics of the particular episode of NSSI, such as the method or function. In addition, adolescents who commit recurrent NSSI (compared to those who do so sporadically) have poorer emotional regulation, academic performance, more interpersonal difficulties (e.g. high sensitivity to rejection), and a negative attributional style. Importantly, emotional dysregulation persists even after discontinuing NSSI, which suggests that it plays a central role in NSSI.

From this perspective, some authors have postulated that NSSI may be a starting point in a heterotypic trajectory towards psychopathology, and this hypothesis is supported by the fact that early onset NSSI is associated with increased...
risk of Borderline Personality Disorder (BPD)\textsuperscript{37}. In this scenario, the NSSI would be important for detection and early intervention in young people who are at risk of BPD\textsuperscript{36,38}.

**FACTORs ASSOCIATED WITH NSSI**

Current literature highlights some important factors to consider when analyzing NSSI, including gender differences, history of traumatic events in childhood, method of self-injury, frequency, and functionality.

**Gender differences**

Studies on NSSI prevalence are inconsistent in terms of sex differences. Historically, NSSI was thought to be specific to females\textsuperscript{39}, with some studies reporting significantly higher incidence in females (1.5-3 times more than in men\textsuperscript{44}; see also\textsuperscript{75,49}). However, many other studies have found no sex differences\textsuperscript{41-43}. A recent meta-analysis showed that females are more likely than males to have a history of NSSI (although the effect size is low); this is more evident in clinical samples, and is independent of age\textsuperscript{44}.

Moreover, previous studies show sex differences in the methods of NSSI and the context in which it is carried out. For instance, adolescent females are more likely to use methods that result in bleeding (i.e. cutting or severely scratching oneself), while adolescent boys are more prone to hitting or burning themselves\textsuperscript{45}. Similar data have been obtained in adult samples\textsuperscript{46}.

**Adverse experiences**

Some studies suggest an elevated risk of NSSI in people who have experienced adverse life events during childhood, such as sexual abuse or parental neglect\textsuperscript{47}, although these findings are not consistent. For example, a review of 43 studies found a modest relationship between sexual abuse in childhood and NSSI\textsuperscript{48}. Interestingly, this review suggests that sexual abuse in childhood is associated with NSSI because they share risk factors (correlation), but not because the former promotes the latter (causality).

In addition, other adverse interpersonal experiences are frequently associated with increased risk of NSSI\textsuperscript{49}, such as having suffered bullying from schoolmates during childhood and/or early adolescence\textsuperscript{50}.

**Method, frequency and function**

Most self-injurers cut themselves (70-97\%) using a sharp object such as a knife or blade, mainly on the forearms, legs and/or abdomen. Other common methods are hitting (21-44\%) or burning themselves (15-35\%\textsuperscript{14,51}). However, most people who self-injure use different methods\textsuperscript{52}. NSSI is not usually impulsive\textsuperscript{53}, as the individual usually plans the self-injury when they are alone and experiencing negative ideas or emotions (e.g. unpleasant memories, feeling angry), or in response to a stressful event\textsuperscript{44}. Paradoxically, most people who self-harm report feeling little or no pain during the self-injury. This phenomenon, which sometimes makes it more difficult to treat NSSI, is related to a process of habituation or to the release of endorphins (e.g. see Bresin and Gordon\textsuperscript{59}).

The frequency of NSSI is higher in clinical than in community or student samples\textsuperscript{40,58}. Students report <10 NSSI episodes throughout life, while psychiatric in-patients report >50 episodes of NSSI during their lives\textsuperscript{13}. In particular, 20.84\% of university students report having self-injured more than 5 times throughout their lives\textsuperscript{57}. Using an ecological momentary assessment methodology, Nock et al. found that adolescents with NSSI report having ideas of self-injury about five times a week and commit NSSI twice a week\textsuperscript{58}.

Studying the factors that motivate or reinforce self-harm behaviors may help to understand how NSSI is maintained over time\textsuperscript{60,61}. For example, some theoretical models have been proposed, such as the experiential avoidance model\textsuperscript{63}, the emotional cascade model\textsuperscript{61}, and the integrative model from Nock\textsuperscript{62}. The latter, proposes that two motivations for NSSI be combined (intrapersonal or automatic, and interpersonal or social), which in turn can be associated with positive or negative reinforcement. Intrapersonal motivation is associated with the intention to change one’s internal state, e.g. an emotion or thought. For example, self-harm to obtain emotional relief or to stop thinking about suicide is an intrapersonal function associated with negative reinforcement, while self-injury to feel alive or to generate a positive emotion is an intrapersonal function associated with positive reinforcement. On the other hand, interpersonal motivation seeks change in the external environment. An example associated with positive reinforcement might be to receive attention from others, while negative reinforcement might be to avoid arguments\textsuperscript{64,66}. Several assessment instruments, such as the Inventory of Statements About Self-Injury (ISAS, see Table 2), have been specifically designed to evaluate the functionality of NSSI\textsuperscript{63}.

Importantly, the intrapersonal functions of NSSI are the most common in the clinical and non-clinical population\textsuperscript{20,60,66}, both in adolescents\textsuperscript{61,65} and adults\textsuperscript{67}. Affective regulation is the most commonly reported function (90\%\textsuperscript{59,68}), although most self-injurers report different NSSI functions. For example, in a sample of students, those with NSSI reported an average of 4.76 functions\textsuperscript{77}, which is sig-
significant because a greater number of NSSI functions is associated with increased risk of associated psychopathology69.

NSSI functions have been studied in various clinical samples, especially in BPD patients, who mainly commit NSSI in order to reduce tension, relieve negative emotions, and/or to self-punish70. Given this, it may be useful to determine NSSI functions in non-clinical samples to facilitate early detection of BPD in young people.

**NSSI AND PSYCHOPATHOLOGY**

While mental disorders are not uncommon in people who self-injure, the presence of NSSI does not imply that there must necessarily be a mental disorder. NSSI is observed in a heterogeneous list of diagnoses9,71, including eating disorders, substance use, depression, anxiety, and especially BPD.4,9,14,72,73. Therefore, we should reject the idea that NSSI is simply a sign of BDP, as it is a transdiagnostic phenomenon74,75.

Previous research has established subgroups of self-injurers. For instance, Klonsky and Olino34 propose four groups: (1) individuals who experiment with NSSI (low frequency of NSSI) and who present few clinical symptoms; (2) individuals who begin to self-harm at a very young age, report a higher frequency of NSSI than the first group, and use methods such as biting, pinching and hitting; (3) individuals who report high levels of anxiety and other clinical symptoms, commit NSSI using different methods (e.g. cutting, tearing or scratching), and report both interpersonal and intrapersonal motivation; and (4) individuals with significant psychiatric symptoms who mainly self-injure by cutting themselves, mainly through intrapersonal motivation, and who report lower impulsivity in committing NSSI (i.e. greater planning).

In addition, various personality factors have been associated with the NSSI. First, negative emotionality and difficulty in regulating negative emotional states are thought to be key factors in NSSI. In this context, some authors have developed comprehensive models of NSSI based on emotional dysregulation, which state that individuals self-harm in response to a greater frequency of negative emotional states and a lower tolerance to these states59. Second, self-deprecation, which has been shown to be associated with NSSI with motivation to self-punish (or express anger towards oneself). Third, impulsivity, which has been linked to NSSI but with inconsistent results. Considering impulsivity as a multifactorial construct, urgency (the inability to resist an impulse during a negative affective state) is the most prominent factor among self-injurers68.

Notwithstanding the above evidence, most studies on NSSI have focused on its relationship with BPD, partly be-

<table>
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<th>Table 2</th>
<th>NSSI functions assessed by the Inventory of Statements About Self-Injury</th>
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<tbody>
<tr>
<td><strong>Intrapersonal</strong></td>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>Affect Regulation</td>
<td>Temporary relief of intense negative arousal</td>
</tr>
<tr>
<td>Anti-dissociation (or feeling generation)</td>
<td>To end the experience of depersonalization or dissociation</td>
</tr>
<tr>
<td>Anti-suicide</td>
<td>To replace or compromise with the impulse to commit suicide</td>
</tr>
<tr>
<td>Marking Distress</td>
<td>To create a physical signal of a negative emotion</td>
</tr>
<tr>
<td>Self-punishment</td>
<td>To derogate or express anger towards oneself</td>
</tr>
<tr>
<td><strong>Interpersonal</strong></td>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>Interpersonal Boundaries</td>
<td>To assert one's identity or a distinction between self and others</td>
</tr>
<tr>
<td>Interpersonal influence</td>
<td>To seek help from or manipulate others</td>
</tr>
<tr>
<td>Sensation seeking</td>
<td>To generate excitement or exhilaration</td>
</tr>
<tr>
<td>Peer Bonding</td>
<td>Fit with others, feel close to peers</td>
</tr>
<tr>
<td>Revenge</td>
<td>Take revenge on someone</td>
</tr>
<tr>
<td>Self-care</td>
<td>Create physical damage to take care of oneself</td>
</tr>
<tr>
<td>Toughness</td>
<td>Test if you can tolerate and overcome physical pain</td>
</tr>
</tbody>
</table>
cause DSM-IV-TR (and previous versions) only considered NSSI as a BPD symptom. The research is consistent in highlighting the robust relationship between BPD and NSSI, in both clinical and community contexts. For example, 49–90% of patients with BPD report NSSI and, in a previous study, we found an association between NSSI and BPD symptoms in a sample of 238 students.

Based on the high co-occurrence of NSSI and BPD, some studies have analyzed this relationship using the DSM-5 criteria for NSSI in subjects with and without BPD (reviewed in Selby et al.27). The results suggest that ~52% of adolescents who meet the criteria for a diagnosis with NSSI also have BPD, while 78% of individuals with BPD also meet the criteria for NSSI. Therefore, while NSSI is a robust predictor of BPD, they are independent entities. Indeed, the diagnostic overlap between NSSI and BPD is similar to that between BPD and depressive, anxiety, or substance abuse disorders.

**NSSI and suicide**

NSSI is the most robust risk factor for future suicide attempts (e.g. more than the presence of depressive symptomatology or family problems). Specifically, the presence of NSSI is associated with a 3-fold increase in the risk of committing a suicidal act in the future. The relationship between NSSI and suicide is independent of sex, age and the method used to self-harm. In contrast, increased risk of suicidal behavior is associated with the frequency of NSSI (>20 episodes), a prolonged history of NSSI, the use of different NSSI methods (>3 different methods), lack of pain, and immediate emotional relief after self-injury. Some clinical variables, such as the severity of the symptoms or the presence of depressive symptoms, can also modulate this association. While the mechanisms underlying this relationship are largely unknown, some hypotheses have been proposed. Some authors have proposed the notion of a spectrum of self-harm, where NSSI and suicide partially overlap, the only difference being the severity and lethality of the behavior. Joiner has proposed the interpersonal theory of suicidal behavior, which holds that individuals who think about suicide must not only have a desire to end their life, but also be able to overcome their survival instinct. This ability would increase with repetitive painful experiences such as NSSI.

**Social media and Internet**

Social learning and imitation play an important role in the initiation of self-harm behaviors, as seeing these behaviors in school, on television or on the Internet, is a risk factor for committing NSSI. Scientific interest in this phenomenon has been growing in recent years, and there is some controversy about the potential risks and benefits of the available information. For example, Google receives 42 million search requests annually for terms related to NSSI, and one-third of young people (aged 14–25 years) with a history of NSSI report having searched the Internet for help in dealing with NSSI. Therefore, the information available on the Internet could be useful for helping or treating individuals at risk, reducing isolation, encouraging recovery, and reducing the urge to commit self-harm. In contrast, it could also contribute to normalizing NSSI, increasing its acceptance and social reinforcement, or reducing its stigmatization. In line with this, an analysis of the contents of web pages containing information on NSSI found that 91.55% of pages talk about NSSI as a ‘coping mechanism’, 87.23% as ‘addictive and difficult to stop’, and 23.94% as ‘not always painful’. Notably, 29.58% of the pages analyzed contained explicit material such as pictures.

A similar scenario is observed for social networks such as Instagram. A recent study of hashtags related to NSSI (in German), found a total of 32,182 images related to the NSSI over a 4-week period. Of these, 10% were injuries caused by cuts on the legs or arms, and the average age of the users was surprisingly low (14.8 years). A cause for concern is that young people often use hashtags that try to avoid control of the network itself (e.g. #selfinjuryyy, #cat).

**CONCLUSIONS**

The studies reviewed here show that the NSSI is a very prevalent phenomenon that has become more common in recent years and that requires great attention. Adolescence is a period of special vulnerability for NSSI, especially in the context of DSM cluster B personality traits and/or feelings of hopelessness. Once initiated, the course of NSSI is heterogeneous, and the few longitudinal studies available to date do not allow us to conclude why some individuals cease NSSI behavior, while others will persist.

The method, frequency and function of NSSI are important aspects for understanding this behavior, in both the clinical and non-clinical context. Most studies have focused on analyzing NSSI in BPD, and there are only a few studies of NSSI in other mental disorders.

NSSI is strongly related to suicide, and the available data consistently indicate that NSSI is the most important risk factor for future suicide attempts, which gives it great clinical relevance.

Finally, it is difficult to understand the (growing) phenomenon of NSSI without considering the role of the media in its propagation. Most studies show that the Internet and social networks are a common means through which young
people share their experiences with NSSI and seek information about it.

**FUTURE PROPOSALS**

The heterogeneity of the studies analyzed in this review makes it difficult to draw definitive conclusions and highlights the need for research in this field to resolve some important issues in the coming years. One of the biggest obstacles in NSSI research has been the use of vague and inconsistent language to refer to suicidal behavior (e.g. mutilation, parasuicide). Advances NSSI research will depend on establishing a reliable classification, and the new NSSI diagnosis of section III of DSM-5 will be useful in this regard. A definitive inclusion of NSSI in future versions of the DSM could help to unify how NSSI conceptualized, to standardize assessment protocols, and consequently to facilitate comparisons between studies and improving the consistency of the results.

More studies are also needed to evaluate NSSI in subjects without any psychiatric disorder, especially BPD. This will allow us to verify whether NSSI should indeed be considered as an independent diagnostic entity, or as a symptom within other clinical entities.

The assessment tools used to evaluate NSSI vary between studies and range from specific questions (e.g. “Have you ever harmed yourself during your life?”) to self-reported instruments where individuals must answer questions about NSSI during specific time periods or at any time in their lives. This methodology may result in some biases in the information collected. Since NSSI is episodic, combining classic self-report measures with more ecological measures (e.g. mobile applications) may help to better understanding NSSI from a day-to-day perspective.

Another important aspect that must be addressed in the future is how to regulate and control the information about NSSI on the Internet, in the media, and on social networks. When a person seeks help online, they are likely to obtain low quality information that contributes to disseminating myths about NSSI. Health providers should be aware of this information and guide young patients and their families towards reliable resources. The Internet could be a resource for supporting those at highest risk, and an initial step in seeking professional help.

The difference between countries in terms of the incidence and phenomenology of NSSI, suggests that cultural factors have a relevant role, so it would be necessary to adapt treatments and prevention policies to each specific context.

Finally, while this review has not analyzed treatment or prevention strategies, it has deal with aspects that are relevant for designing interventions. In this respect, it will be important to advance in (i) primary prevention strategies, to stop the significant increase in NSSI behavior among adolescents; (ii) secondary prevention strategies, to identify the NSSI as an alarm signal and prevent it from evolving into other psychiatric disorders such as BPD, and (iii) specific therapeutic strategies that can be implemented in mental health resources.

In summary, all of these topics can be addressed through collaborative work. In our country, the Self-harm Study and Treatment Group (GRETA) has recently been created and is formed by mental health professionals (specialists in childhood, adolescence and adults) who are concerned about the alarming increase of NSSI in daily clinical practice.

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**CONFLICT OF INTEREST**

Authors declare no conflict of interest.

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