

Prevalence and functions of non-suicidal self-injury in Spanish adolescents

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Abstract

Background: This study examined the prevalence, characteristics and functions of Non-suicidal Self-injury (NSSI) among Spanish adolescents. **Method:** The sample consisted of 1,864 adolescents aged between 12 and 19 years (Mean Age = 15.32, SD = 1.97, 51.45% girls). The participants completed a modified version of the self-report scale Functional Assessment of Self-Mutilation (FASM; Lloyd, Kelley, & Hope, 1997) to assess rates and methods of NSSI used during the last 12 months. They also indicated the functions of NSSI. **Results:** NSSI behaviors are common among Spanish adolescents. More than half of the sample showed such behavior in the past year, and 32.2% had carried out severe NSSI behaviors. The functions of NSSI were examined by using confirmatory factor analyses. Results supported a hierarchical model consisting of two second-order factors: automatic reinforcement, which explained both positive and negative automatic reinforcement, and social reinforcement, which explained both positive and negative social reinforcement. **Conclusions:** These dimensions are critical to understand the factors that maintain NSSI behavior and have implications for treatments.

Keywords: Non-suicidal Self-injury, adolescents, reinforcement.

Resumen

Prevalencia y funciones de autolesiones no suicidas en adolescentes españoles. **Antecedentes:** este estudio examinó la prevalencia, características y funciones de las Autolesiones No Suicidas (ANS) entre adolescentes españoles. **Método:** la muestra estuvo conformada por 1.864 adolescentes de edades comprendidas entre los 12 y los 19 años (Edad media = 15,32; SD = 1,97; 51,45% chicas). Los participantes completaron una versión modificada del autoinforme de evaluación funcional de la automutilación (FASM; Lloyd, Kelley y Hope, 1997) para evaluar las tasas y métodos de ANS utilizados durante los últimos 12 meses. También indicaron las funciones del ANS. **Resultados:** las ANS son comunes entre los adolescentes españoles. Más de la mitad de la muestra mostró tal comportamiento en el último año y el 32,2% había realizado conductas graves de ANS. Las funciones de ANS fueron examinadas utilizando análisis factorial confirmatorio. Los resultados apoyaron un modelo jerárquico consistente en dos factores de segundo orden: reforzamiento automático, que explica el refuerzo automático positivo y negativo, y el reforzamiento social, que explica el refuerzo social positivo y negativo. **Conclusiones:** estas dimensiones son fundamentales para comprender los factores que mantienen la conducta ANS y tienen implicaciones para los tratamientos.

Palabras clave: autolesiones no suicidas, adolescentes, reforzamiento.

Non-suicidal self-injury (NSSI) has been defined as intentionally causing bodily harm to oneself in the absence of suicidal intent and for reasons not socially sanctioned (Barrocas et al., 2011; Nock & Favazza, 2009). NSSI increases dramatically between early adolescence and young adulthood (Barrocas et al., 2011). Methods of NSSI include cutting, scratching, burning, hitting, banging, pulling hair, and interfering with wound healing, among others (Klonsky, 2011; Muehlenkamp & Gutiérrez, 2004). Initially, NSSI was considered a symptom of borderline personality disorder and was included as such in the *Diagnostic and Statistical Manual of Mental Disorders-TR (DSM-4*, American Psychiatric Association, 2000). Nevertheless, research has indicated that NSSI is concomitant

to several other disorders such as depression, post-traumatic stress disorder, generalized anxiety, and eating disorders (Bentley, Nock, & Barlow, 2014). This has contributed to the consideration of NSSI as transdiagnostic. In fact, it has been included in the *DSM-5* as a condition that requires further examination (American Psychiatric Association, 2013).

In recent years, an increasing number of studies have examined the prevalence rates of self-injurious behavior among adolescents in North-American countries (for a review, see Barrocas et al., 2011; Klonsky, 2011; Muehlenkamp, Claes, Havertape, & Plener, 2012). Findings are very different depending on the samples. For instance, in community samples, 7.7% of early adolescents reported engaging in NSSI (Hilt, Nock, Lloyd-Richardson, & Prinstein, 2008), and between 13.9% and 21.4% of high school adolescents reported NSSI (Muehlenkamp & Gutiérrez, 2004). Research with clinical samples shows even higher rates (e.g., 40%, Jacobson, Muehlenkamp, Miller, & Turner, 2008). In Spain, there is a scarcity of studies on NSSI. An exception is the study of Díaz de Neira et al. (2013), who found in a clinical sample of 267

adolescents between 11 and 18 years that 21.7% had performed NSSI. However, little is known about the magnitude of the problem in the general population of Spanish adolescents.

Regarding the methods of NSSI, some North-American and Australian studies indicate that cutting is the most frequent method (for examples, see Anderson & Crowther, 2012, in USA; Glenn & Klonsky, 2011, in Canada), followed by hitting or punching oneself. Scratching, carving and biting oneself are also frequent in Northern Europe (Zetterqvist, Lundh, Dahlström, & Svedin, 2013).

Several of the above studies have examined gender differences in NSSI. Some of them indicate that prevalence is higher in girls than in boys (Barrocas, Hankin, Young, & Abela, 2012; Guerry & Prinstein 2010; Whitlock et al., 2011; Zetterqvist et al., 2013). Behavioral methods of NSSI also seem to differ by gender. Girls report cutting most often whereas boys are more likely to report hitting themselves (Barrocas et al., 2012; Laye-Gindhu & Schonert-Reichl, 2005; Whitlock et al., 2011). However, other studies have not suggested gender differences (Hilt, Nock et al., 2008). Barrocas et al. (2011) suggested that methodological factors may have contributed to discrepancies, such as the lack of differentiation between NSSI and suicide attempt behaviors. Due to the inconsistency in the literature on gender differences in NSSI, some experts conclude that additional research is needed to better understand the magnitude of any gender differences (Barrocas et al., 2012).

Prior research has provided a theoretical framework for the function of NSSI. For example, Nock and Prinstein (2004, 2005) proposed the four-function model (FFM) of NSSI. The model is grounded on behavioral theory, which states that behavior is largely controlled by antecedents and consequences. In the case of NSSI behavior, it would be maintained by four distinct functional reinforcement processes, which fall along two dichotomous dimensions: negative versus positive and automatic versus social contingencies. Combining the above two dimensions, the four processes proposed by the model include: (a) automatic negative reinforcement, when NSSI serves to reduce aversive affective or cognitive states, (b) automatic positive reinforcement, when NSSI serves to generate positive feelings or self-stimulation, (c) social negative reinforcement, when NSSI serves to facilitate escape from social situations or to avoid interpersonal demands, and (d), social positive reinforcement, when NSSI serves to obtain attention, facilitate access to resources, or promote help-seeking behavior (Bentley et al., 2014). Whereas other theoretical models focus narrowly on the role of affect regulation in NSSI (Klonsky, 2007), the FFM integrates automatic and social functions, and distal and specific risk factors. A number of studies have found associations between the above functions of NSSI and distress symptoms, such as depression (Hilt, Cha, & Nolen-Hoeksema, 2008).

The above review indicates that NSSI in adolescents constitutes the focus of an increasing body of research. Understanding the functions of NSSI is crucial to develop preventive and intervention approach. Unfortunately, there is a paucity of studies in Spain on this topic, although the prevalence and modalities could be culturally affected. The current study aimed to examine the prevalence and characteristics of NSSI among Spanish adolescents. This aim also included the examination of the functions of NSSI. We expected to confirm the four-factor model proposed by Nock and Prinstein (2004, 2005). With this aim, we adapted the Functional Assessment of Self-Mutilation (FASM; Lloyd, Kelley, & Hope,

1997) to assess rates and methods of NSSI used by the adolescents. The FASM has been used in several studies and its validity has been established (e.g., Hankin & Abela, 2011; Bentley et al., 2014; Lloyd-Richardson, Perrine, Dierker, & Kelley, 2007; Nock & Prinstein, 2004, 2005; Yates, Tracy, & Luthar, 2008).

Method

Participants

The sample consisted of 1864 adolescents aged between 12 and 19 years (Mean Age = 15.32 years, $SD = 1.97$). Of these, 901 were boys and 959 girls (4 did not indicate sex). Students were recruited from 22 high schools and 3 vocational schools in the Basque Country (Spain). The schools were chosen using a stratified random sampling method. The strata were created on the basis of type of school (32.4% public and 67.6% private) and the geographical area (68.2% urban and 31.8% rural). The socio-economic levels were determined by parental education and occupation, which were reported by the adolescents, according to the Spanish Society of Epidemiology and the Spanish Society of Family and Community Medicine Working Group (2000): 19.2% low, 18.3 medium-low, 34.4% medium, 22.5% medium-high and 5.6% high.

Instrument

The self-report scale Functional Assessment of Self-Mutilation (FASM; Lloyd, Kelley, & Hope, 1997) was used to assess rates, methods, functions and other characteristics of NSSI during the last 12 months. The FASM has three parts: In the first part, the adolescents indicated whether and how often they had engaged in 10 different forms of NSSI, including cutting or carving skin, picking at a wound, self-hitting, scraping skin to draw blood, self-biting, inserting objects under the skin or nails, self-tattooing, burning skin, pulling out own hair, or erasing (rubbing) skin to draw blood. According to Lloyd et al. (1997), the above behaviors can be classified into two factors: moderate/severe NSSI, which include items considered more clinically severe (cutting/carving, burning, self-tattooing, scraping, and erasing skin), and minor NSSI, which consists of less severe behaviors (hitting self, pulling hair, biting self, inserting objects under nails or skin, and picking at a wound). Following the procedure used by Yates et al. (2008), frequency scores were recoded into a 5-point scale: with each number indicating the frequency of the act over the past 12 months: 1 (*0 times*), 2 (*1 time*), 3 (*2 - 5 times*), 4 (*6 - 10 times*), and 5 (*≥ 11 times*).

In the second part of the FASM (six items), those adolescents who reported having engaged in forms of NSSI were asked "whether medical treatment was obtained" as a proxy for the severity of the injury. Participants were also asked the length of time they contemplated the behavior(s), at what age their NSSI first began, whether NSSI was performed under the influence of drugs or alcohol, the degree of physical pain experienced during NSSI, and whether any of these behaviors was a suicide attempt.

In the third part (22 items), the functions of NSSI were assessed. Participants who had reported any NSSI behavior during the last year were asked how often they had engaged in NSSI for each of the 22 different reasons, from 0 (*never*) to 3 (*often*).

Procedure

As this was the first adaptation of the FASM to Spanish adolescents, the guidelines from the International Test Commission (2010) and the recommendations by Muñiz, Elosua, and Hambleton (2013) were followed. Back-translation procedures were used. The research team considered the linguistic and cultural differences in the translation and adaptation of the items to Spanish adolescents. Furthermore, a pilot study with a small sample of adolescents indicated that adolescents did not differentiate one of the original items of the FASM (“picking areas to draw blood”) from the item “scraping skin to draw blood” and therefore it was dropped in the Spanish version. Trained research assistants administered the FASM in the centers. All participants were evaluated in groups during the regular class schedule in their classrooms. Participation was voluntary and anonymous. Parents were informed and invited to decide about the participation of their children.

Data analyses

Descriptive statistics were conducted to examine the frequency and basic characteristics of the community sample of Spanish (Basque) adolescents. In addition, we assessed the structure of the functions of self-reported NSSI (Nock & Prinstein, 2004). Confirmatory factor analyses were conducted with MPLUS 7.2 (Muthen & Muthen, 2013). We used the WLSMV estimator, which is adequate for the categorical nature of the items and deviations from normality, which are characteristics of NSSI behavior. Fitness of the models was evaluated by means of the comparative fit index (CFI), the Tucker-Lewis Fit index (TLI), and the root mean squared error of approximation (RMSEA). CFI and TLI values of .95 or greater and RMSEA values of .06 or lower indicate that the model adequately fits the data. The study of the structure of the function of NSSI items was conducted with the responses of those adolescents who had reported at least one act of NSSI during the last year ($n = 999$). Adolescents whose only behavior had been biting oneself on fewer than 6 occasions were omitted from the analyses (see results section). In consideration of

recommendations from Nock and Prinstein (2004), item 19 was dropped from the analyses.

Results

Frequency of NSSI behaviors, methods, and characteristics

Table 1 displays the percent of participants reporting each type of self-injury behavior. The most reported behaviors were biting oneself, scraping the skin, and picking at a wound. In fact, the prevalence of biting was extremely high (48%), which suggests that this behavior may be considered somewhat socially acceptable and normative. For this reason, we decided not to include in the estimation of the total prevalence of self-injury those cases ($n = 230$) in which the only self-injury behavior was biting oneself and that behavior had happened very occasionally (frequency lower than 6 times). Applying this criterion, the total prevalence of NSSI in the sample was 55.6% ($n = 999$). Regarding the minor versus severe nature of the NSSI behaviors, 23.4% of the sample reported minor NSSI behaviors, and 32.2%, severe NSSI behaviors. The average number of NSSI behaviors was 2.01 ($SD = 1.32$). Regarding sex, more girls (58%) than boys (53.3%) self-harmed, $\chi^2(1) = 4.06$, $p = .046$. Differences were not statistically significant for severity of the behaviors: 24.5 and 22.4% of girls and boys, respectively, performed only minor NSSI, and 33.8 and 30.9%, respectively, performed both minor and severe NSSI.

Table 1 also displays the frequencies of those participants who, after injury, required medical treatment. Highest frequencies were for erasing one’s skin to the point of drawing blood, giving oneself a tattoo, and burning one’s skin, which are all within the severe NSSI category. In all, 4% of the total sample of participants received medical treatment for the self-injury: 1.8% of the participants reported minor self-injury, and 11.4% of the participants engaged in severe self-injury.

Regarding suicidal intention, 6.4% of the participants had employed self-injurious behavior trying to kill themselves (7.6% of the participants that had used severe types of NSSI). This percentage was higher among those who had received medical

Table 1
Frequencies of NSSI behaviors in the last year and cases reporting medical treatment

	Total prevalence %	0 times %	1 time %	2-5 times %	6-10 times %	>11 times	Average frequency N	Medical treatment %
Minor NSSI behaviors								
1. Bit yourself (e.g., your mouth or lip)	48	52	1	26	0.8	20.3	234.19	1.1
5. Hit yourself on purpose	10.6	89.4	1.5	7.4	0.2	1.6	26.61	2.9
6. Pulled your hair out	4.3	95.7	0.4	2.9	0.1	0.9	109.91	4.6
8. Picked at a wound	15.6	83.4	1	12.6	0.2	2.8	59.29	6
10. Inserted objects under your nails or skin	3.5	96.5	0.6	0.9	0.2	0.6	42.69	10
Severe NSSI behaviors								
2. Scraped your skin	18.6	81.4	0.5	12.6	0.5	5	145.38	8.4
3. “Erased” your skin to the point of drawing blood	7.9	92.1	0.8	5.4	0	1.7	108.74	15.9
4. Cut or carved your skin	8.1	91.8	1.4	5.6	0.3	0.9	38.82	6.8
7. Gave yourself a tattoo	2.8	97.2	1.8	0.5	0.1	0.4	24.68	14.3
9. Burned your skin (i.e., with a cigarette, match or other hot object)	6.1	93.9	1.8	1	0.2	0.6	15.67	12.2
Other	16.2	83.8	0.3	0.7	0.1	2.2	186.51	9.9

attention (7.7%) than among those who had not (1.4%), $\chi^2(1, n = 999) = 13, p < .001$. The majority (67.9%) indicated that they did not experience any pain during self-harm, 26.3% little pain, 4.1% moderate pain, and 1.7% severe pain. Experienced pain was slightly higher among the participants who severely self-harmed: 53.4% no pain, 36.9% little pain, 6.5% moderate pain, and 3.2% severe pain. Only 12.4% of the participants who self-harmed indicated that they performed NSSI behaviors while they were under the influence of drugs or alcohol. On average, self-injurious behaviors started at 9.52 years ($SD = 4.04$), indicating that persons engaging in NSSI had been doing so an average of approximately 5.8 years. There were no gender differences in starting age. Regarding planning of the act, the majority of the participants stated that they performed the NSSI behavior automatically—without planning— or having thought about it for less than one hour (91.6 and 95.6%, respectively). Others reported considering the act for hours (less than one day) and for a few days (3 and 1.4%, respectively).

Functions of NSSI

A preliminary confirmatory factor analysis indicated that the four-factor structure proposed by Nock and Prinstein (2004) exhibited a good fit to the data, $\chi^2(183, N = 999) = 418, RMSEA = .036 [.031, .040], CFI = .98, TLI = .98$. This structure consisted of automatic positive reinforcement (3 items), automatic negative reinforcement (2 items), social positive reinforcement (4 items), and social negative reinforcement (12 items). All factor loadings were statistically different from zero ($p < .001$) and higher than .40 (see Table 2).

As correlations between automatic reinforcement factors and between social functions factors were high (.72 and .63, respectively), we tested a second-order structure in which two broader factors explained the associations among the four first-order factors. We used the procedure proposed by Byrne (2012). The model consisted of two second-order factors: automatic reinforcement, which explained both positive and negative automatic reinforcement, and social reinforcement, which explained both positive and negative social reinforcement. Fit indexes were also excellent for this model, $\chi^2(184, N = 999) = 419, RMSEA = .035 [.031, .040], CFI = .98, TLI = .98$. The test for the difference between the chi-square estimated via WLSMV was not significant, $WLSMV \Delta \chi^2(1, N = 999) = 2.03, p = .16$. Therefore, the second-order model was an adequate solution and preferable because it represents a more parsimonious model to explain the functions of NSSI. We also tested an alternative two-factor second-order structure in which second-order factors were positive and negative reinforcement,

each of which comprised the two positive reinforcement and the two negative reinforcement factors, respectively. Although this model obtained good fit indexes, $\chi^2(184, N = 999) = 330, RMSEA = .043 [.039, .047], CFI = .97, TLI = .97$, the difference between the chi-square estimated via WLSMV was statistically significant, $WLSMV \Delta \chi^2(1, N = 999) = 64, p < .001$.

Cronbach's alpha coefficients were .61, .76, .80, and .86 for automatic negative reinforcement, automatic positive reinforcement, social negative reinforcement, and social positive reinforcement, respectively. The Cronbach's alpha coefficients were .80 and .84 for the second-order automatic and social reinforcement factors, respectively.

Table 2
Factor loadings for the functions scale

Reasons	Factor loading
Automatic negative Reinforcement	
2. To relieve feeling "numb" or empty	.83
14. To stop bad feelings	.79
Automatic Positive Reinforcement	
4. To feel something, even if it was pain	.76
10. To punish yourself	.83
22. To feel relaxed	.48
Social Negative Reinforcement	
1. To avoid school, work, or other activities	.63
5. To avoid having to do something unpleasant you don't want to do	.76
9. To avoid being with people	.86
13. To avoid punishment or paying the consequences	.82
Social Positive Reinforcement	
3. To get attention	.80
6. To get control of a situation	.67
7. To try to get a reaction from someone, even if it's a negative reaction	.85
8. To receive more attention from your parents and friends	.86
11. To get other people to act differently or change	.81
12. To be like someone you respect	.83
15. To let others know how desperate you were	.84
16. To feel more a part of a group	.85
17. To get your parents to understand or notice you	.86
18. To give yourself something to do when alone	.50
20. To get help	.85
21. To make others angry	.76

Table 3
Descriptive statistics and gender differences in NSSI functions

	Total sample		Girls		Boys		F	Cohen's d
	M	SD	M	SD	M	SD		
Automatic reinforcement	0.34	0.52	0.35	0.53	0.33	0.38	0.48	0.04
Positive automatic reinforcement	0.29	0.60	0.30	0.61	0.29	0.59	0.12	0.02
Negative automatic reinforcement	0.39	0.57	0.40	0.57	0.38	0.57	0.63	0.04
Social reinforcement	0.17	0.34	0.14	0.29	0.20	0.38	10.24**	0.18
Positive social reinforcement	0.18	0.39	0.15	0.35	0.21	0.43	8.14*	0.15
Negative social reinforcement	0.17	0.34	0.14	0.27	0.19	0.39	10.23**	0.15

* $p < .05$; ** $p < .001$

Descriptive statistics for the factors and gender differences are shown in Table 3. Boys scored higher in the social reinforcement factors but the effect sizes were small. There were no gender differences in the automatic reinforcement function.

Discussion

The results of this study show that NSSI behaviors are common among Spanish adolescents. More than half of the sample showed such behavior in the past year, and 32.2% had performed severe NSSI behaviors. Regarding methods of NSSI, biting oneself, scrapping the skin, and picking at a wound were the most frequent. These results are different from those obtained in other countries, where cutting was among the most frequent (Anderson & Crowther, 2012; Glenn & Klonsky, 2011). Therefore, the modalities of NSSI could be culturally influenced, with some methods being more acceptable in some countries than in others (Lloyd, Kelley, & Hope, 1997; You, Leung, & Fu, 2012). The girls showed a higher prevalence of NSSI behaviors, as in some previous studies (e.g., Barrocas et al., 2011; Guerry & Prinstein, 2010). However, the functions of NSSI were quite similar in boys and girls. Therefore, future research should examine the variables associated with the higher use of NSSI in girls.

In some cases (4%), NSSI behaviors caused injuries that required medical attention. This was primarily associated with severe NSSI acts such as erasing one's skin to the point of drawing blood, giving oneself a tattoo, and burning one's skin. Suicidal intention was present only in a small percentage of the participants who self-harmed, which supports the conclusion that NSSI behavior is different from suicidal behavior.

The functions of NSSI were examined by using confirmatory factor analyses. Results supported a hierarchical model consisting of two second-order factors: automatic reinforcement, which explained both positive and negative automatic reinforcement, and social reinforcement, which explained both positive and negative social reinforcement. This model is consistent with that obtained by Nock and Prinstein (2004), but adds the existence of the two higher order dimensions. These dimensions are critical to understand the factors that maintain the NSSI behavior and have implications for treatments. Adolescents who engage in NSSI

to achieve positive social reinforcement or to avoid negative social reinforcements may benefit from interventions focused on changing the consequences of NSSI behavior in the social environment. However, when the function is automatic, other interventions may be more beneficial. Adolescents who use NSSI to obtain automatic negative reinforcement may be trying to down-regulate or avert themselves from uncomfortable emotional experiences (Bentley et al., 2014). This is consistent with findings that negative emotions or distress are present prior to an episode of NSSI, and that following an episode of NSSI, there is a decrease in negative emotions and an increase in positive feelings (Klonsky, 2007). Similarly, adolescents using NSSI to obtain automatic positive reinforcement may be trying to increase desired thoughts or feelings, or up-regulate emotions. In both, the NSSI behavior involves emotional dysregulation. In these cases, interventions that facilitate mindful emotional awareness can be very useful (Gratz, 2007; Walsh, 2006). These interventions should be implemented early, as the findings suggest that the onset of NSSI behaviors take place in childhood (average starting age was 9.52 yrs.).

This study has some limitations. The findings were based exclusively on self-reports and other additional approaches to collect information (e.g., interviews, self-monitoring behavioral records, parent reports) would be desirable. In addition, comparisons with clinical samples could contribute to elucidating the role of NSSI behaviors. Despite these limitations, it is important to note that this is the first study that examines NSSI behaviors in Spanish adolescents. The findings indicate that this is a highly prevalent negative behavior, with a significant subset with demonstrable severity that requires medical treatment. Functions of NSSI are complex and involve both automatic and nonautomatic reinforcement mechanisms. Early interventions focused on strategies that improve emotional regulation can be very helpful to prevent self-injurious behaviors. Finally, future studies should explore the factors involved in the onset of this problem.

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