Biting myself so I don't bite the dust: prevalence and predictors of deliberate self-harm and suicide ideation in Azorean youths

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Abstract

Increasing rates of Non-Suicidal Self-Injury (NSSI) behaviors among adolescents have been observed globally, while suicidal behavior has been pointed as a major cause of death during adolescence. **Objective:** The current study aimed to characterize NSSI behaviors, methods and functions, and suicide ideation in the adolescent population of a Portuguese community in S. Miguel Island. **Method**: A sample of 1763 adolescent, between 14 and 22 years old, was randomly drawn from public and private schools and were administered a set of self-report questionnaires. Descriptive and regression analyses were used to look for specific relationships and predictors of NSSI and suicide ideation in this isolated community. **Results:** Approximately 30% of youths have reported at least one NSSI behavior, a rate that is twice as high as most studies carried out in Portugal (mainland) and other European countries. Biting oneself was the most frequent form of NSSI, and NSSI behaviors served predominantly automatic reinforcement purposes (regulate disruptive emotional states). NSSI and suicide ideation encompassed different distal and proximal risk factors. **Discussion**: Exploring and characterizing these phenomena is still necessary to provide a better understanding and current conceptualizations, and to guide the development of more effective prevention and intervention strategies in youths.

Keywords: non-suicidal self-injury, suicide ideation, adolescence, risk-behaviors, impulsivity

1. Introduction

Increasingly high rates of self-harm behaviors were found among adolescents over the past years (1) a phenomenon that constituted an important focus of research and professional intervention in several countries (2) due to the physical and psychological consequences of this behavior in younger populations. Suicidal behavior and completed suicide, a distinct but related phenomena, has also been pointed as a leading cause of death during adolescence and young adulthood (15-29 years old), a personal tragedy that greatly affects those who are close to the deceased person (3,4).

A large body of research has focused on deliberate self-harming behaviors or Non-Suicidal Self-Injury (NSSI), which was found across the lifespan and not bound to pathological functioning or entity (e.g. a symptom of BPD). Contrarily, NSSI was found to be present in a pervasive fashion, with many forms and exerting different functions (5). Current literature points out to the age of onset of NSSI occurring between 11 to 15 years of age (6), and alarmingly high prevalence of NSSI being found in non-clinical adolescent populations. However, despite recent proposals from the DSM-5, the prevalence rates of self-harming behaviors has been divergent and omissive in several aspects, stemming from the issues related to the very definition of NSSI and terminology, to the lack of information on the development and course of NSSI, which currently does not allow a complete understanding and identification of risk or protective factors, as well as the cultural aspects that may influence the onset and course of NSSI behaviors (1,7,8). In this framework, there is also little consensus concerning the frequency, severity or taxonomy of specific forms of NSSI (9). In addition, NSSI may draw unwanted clinical attention, and can be regarded as shameful or stigmatizing, leading individuals to conceal this behavior, increasing the difficulties in the study of this phenomenon (1,10).

In the CASE (Child & Adolescent Self-harm in Europe) study, high prevalence of self-harming behaviors and thoughts were reported (8). In a sample of adolescents from 6 European countries and Australia, with ages between 14 and 17 years old, 13.5% of girls and 4.3% of boys report at least one self-harm episode over their lifetime. Different studies also point out to a higher frequency of NSSI behaviors in female adolescents than in males (11), while more recent studies indicate similar percentages of self-harm across genders, generally occurring between 14 and 24 years of age (12).

Current conceptualizations of NSSI postulates that these behaviors may serve complex social purposes, as a way to define social boundaries or exert interpersonal influence, to communicate distress to others ("to show how desperate I felt", "to scare someone", "I wanted to get back at someone", "I wanted some attention"), but also for self-regulation, self-punishment, to prevent dissociative states or for sensation-seeking purposes ("to die", "to punish myself" and "to free myself from psychological suffering"). These motives can also co-exist (7,8,13).

Several possible risk factors have been found to be associated with NSSI, such as impulsivity, self-esteem, and stress (14); impulsivity, anger, Borderline Personality Disorder, depressive reactions, depression (15); less (adaptive) coping strategies (16). Lower levels of education, sexual and physical abuse, emotional or psychological neglect in childhood (5,6,9); self-criticism (17) have also been reported as associated risk factors to NSSI (see 9 for a review). In adult samples, history of NSSI was associated with the presence and number of suicide attempts, and was a better predictor of suicide ideation and attempt than depression, hopelessness and borderline personality traits (18). Studies of this nature often point distal and proximal factors that can increase risk of NSSI in youths, for instance, adverse life experiences and negative parental styles (neglect, hostile criticism), as well as a history victimization and negative affect,

where only a few studies explore the importance of more "positive" variables over development that can constitute protective factors of NSSI onset (19,20).

Self-harm behavior can be often related to suicidal ideations and attempts and constitutes the main risk factor for suicide (21). Several studies point out to self-harm behaviors resulting in suicide when untreated (22–25). It is possible that the increased reinforcement experienced by repetitive self-harm behaviors render individuals more capable of sustaining the pain and fear resulting from those behaviors, and becoming able to perform more severe forms of self-injurious behaviors that can progressively lead to suicide (18,26). Similarly, it is possible that suicide is an unintentional result of NSSI (27), to the extent that a fatal consequence may accidentally result from a NSSI behavior. Nevertheless, these often associated behaviors are two distinct actions (28). Despite several studies suggesting that the risk of suicide attempt increases with the frequency of NSSI, more studies are necessary to understand the difference and relationship between these two behaviors (9,16).

The observed differences concerning gender and differences between countries in NSSI rates demand for multidimensional analysis of this phenomena, in order to culturally adjust prevention and treatment needs (29). In Portugal, one study on adolescents' health has included two questions about deliberate self-harm in youths between 13 and 15 years old in which 15.5% have reported engaging in one NSSI behavior over the past year, including mainly participants from the mainland territory and participants from the Madeira Island (30). In a more recent study, 21.7% of youths from the central region reported having engaged in NSSI at least once over their lifetime (20). To the best of our knowledge, no study on self-harm and suicidal ideation among youths has extensively focused on participants from more isolated Portuguese communities, and research in this area is urgent in order to create future intervention programs adapted to

their specific needs. Considering that the issues of self-harm behaviors is still an underestimated issue, it is relevant to carry out more studies in this field, particularly in insular regions such as the Azorean Islands, in which no data on self-harm and suicidal ideation exist. Suicide rates can vary according to region, sex, age and ethnicity. In more isolated places (e.g. Micronesia, Cuba, Sri Lanka, Fiji, Mauritius, Samoa and Seychelles islands), suicide rates tend to be higher than the regional indicators (3). It can be particularly important to compare, in countries where populations share the same culture, but reside in more isolated places such as islands, with individuals from the mainland, in order to look for possible nuances in the prevalence and factors interfering with the onset and course of NSSI and also suicide ideation.

Because adolescence is a period characterized by intense transformations, youths tend to develop more aggressive, impulsive, self-injurious or even suicidal ideation and behaviors as ways to cope with their problems and conflicts, and these conflicts may predispose youths to psychic suffering and to more intense crisis situations and suicidality (4,31). It is then important to understand to what extent the aspects that characterize this developmental period may be misadjusted and lead to the adoption of more severe risk behaviors and psychopathology (32), a particularly relevant aspect in more isolated communities such as those from the Portuguese Islands.

Thus, the current study goals are to characterize NSSI and suicide ideation in a large sample of Azorean adolescents. This should be accomplished by describing and exploring the relationships between NSSI, disruptive emotional states, suicide ideation, anxiety and depressive symptomatology, and by looking for possible predictors of NSSI and the specific functions of NSSI, as well as the predictive value of NSSI on suicide ideation in those youths.

We adopt a more restrict definition of NSSI behavior, according to the conceptualization by Mangnall & Yurkovich (27), referring solely to the direct behavior that cause slight to moderate physical lesions, without conscious suicide intentions, that occurs in the absence of psychosis or organically determined intellectual disabilities.

2. Method

2.1. Participants and procedures

Participants were recruited in private and public schools in S. Miguel Island, Azores. Prior to data collection, authorizations were requested to the Regional Department of Education (*Direcção Regional da Educação* - DRE), that granted the permission and provided the information on the total number of students and school councils for all schools in the São Miguel island. School councils were contacted firstly and agreed to cooperate. All classrooms were numbered and 50% of the students of each grade were randomly drawn (through ballot box method). After this procedure, classroom's directors would schedule two days in which researchers could inform and supervise the questionnaire administration to the students. In the first session, information on the study goals, anonymity, and confidentiality were provided to all participants, who were given a written informed consent form. In the second session, all students (or their legal representatives) that gave their informed consent were supervised by the researchers while filling the assessment protocol in the classroom. The sample was also divided in two groups: the first group comprising adolescents without a history of NSSI and the second group comprising adolescent with current or prior history of NSSI behaviors (table 1).

2.2. Measures

Impulse, Self-harm and Suicide Ideation Questionnaire for Adolescents - ISSIQ-A (33). The ISSIQ-A is a self-report questionnaire for adolescents, assessing Risk Behaviors (e.g. alcohol and substance use, reckless driving, promiscuous sexual behavior), Impulsivity, Suicide Ideation and Self-harm. The items are assessed on a Likert-type frequency scale ranging from 0 = never to 3 = always. This instrument also assesses two functions of self-harming behaviors (social reinforcement and automatic reinforcement) in an additional module with categorical responses (Yes/No). Higher scores in each module (factor) indicate the presence and frequency of each of those constructs, and the functions of self-harm subscale indicates the predominant function for those who engage in self-harming behavior: automatic reinforcement or social reinforcement functions. Studies by Barreto Carvalho et al. (33) confirmed the factor structure and psychometric properties of the ISSIQ-A, which revealed good internal consistencies (ranging from .77 to .93) and convergent validity with similar measures. In the current study, Cronbach's alpha (α) ranged from .768 (Impulse and social function of NSSI subscales) to .932 (Automatic Reinforcement subscale).

Childhood Experiences of Care and Abuse Questionnaire - CECA-Q (34,35). The CECA-Q focuses on parental rearing styles experienced during childhood, and on the identification of the parental figure that was most significant before 17 years old. This comprises a set screening questions for sexual and physical abuse, and Neglect and Antipathy scales scored separately for each parental figure (e.g. mother and father). The Antipathy and Neglect scales comprise 8 items each (e.g. He/she was critical towards me; He/she was interested in my problems). All items are presented twice, in order to be rated separately for each parental figure, in a 5 point Likert-type scale (1 = Not at all to 5 = totally). In the study by Bifulco et al. (34), the CECA-Q was as a good screening tool for assessing early adverse relationships with caretakers and to the study of the role

of these adverse experiences in the development of psychopathology. Internal consistency was of .81 to Antipathy and .80 to Neglect subscales. In Portuguese version, internal consistency ranged from .80 to .61. In the current study, internal consistencies ranged between .60 (Mother's neglect) and .75 (antipathy from father).

Early Memories of Warmth and Safeness Scale - adolescent version - EMWSS-A (36,37). The EMWSS-A is a 21-items self-report scale assessing retrospectively the memories of experiences of warmth and affection during childhood. Each item is rated on a 5-point Likert frequency scale (1 = rarely, to 4 = most times). The scale is one-dimensional and higher scores indicate the presence of positive and nurturing rearing experiences. Original studies by Richter et al., (36) presented good internal consistency (α =.97) as well as in the Portuguese validation studies of this scale: α =.95 (37). In the current study, internal consistency was also very good (α =.95).

Forms of Self Criticism/Attacking and Reassuring Scale – FSCRS (17,38) is a 22-item self-report questionnaire that evaluates the participants' reaction in the face of mistakes or when something goes wrong for them. Items are scored on a 5-point Likert scale (from 0 = not like me at all to 4 = exactly like me). The FSCRS assesses 3 different factors: Inadequate self, Hated self, which refer to different degrees of self-attacking and self-criticizing, and Reassured Self, which refers to the ability to soothe oneself when facing adversities. Studies with the original version of FSCRS by Gilbert et al. (17) have presented good internal consistency of the three subscales, and Portuguese studies have also found good or very good internal consistencies in both general and clinical samples (39). Internal consistencies in a sample of 350 Portuguese adolescents were good, with α = .90 for inadequate self; α = .75 for Hated self and α = .86 for reassuring self subscales. In the current study, internal consistency was very good: α = .82 for inadequate self; α = .77 for Hated self and α = .83 for reassuring self subscales.

Aggression Questionnaire - AQ (40,41). The AQ is 29-item a self-report questionnaire that assesses aggressiveness in four aspects: hostility, anger, verbal aggression and physical aggression. Items are scored on a 5-point Likert-type frequency scale, from 1 = never to 5 = always. These subscales allow the measurement of aggressiveness in three dimensions: instrumental, cognitive and emotional. Internal consistencies of the original version range between .72 and .85and the total scale presented a Cronbach's α = .89 (42). In the first study of the Portuguese (43), internal consistencies ranged from .60 to .81, and α = .87 for the total scale. For the purposes of this study, only the total and Anger subscale was used, which represents the emotional component of aggression. The Anger subscale showed adequate internal consistency for the total sample: α = .89.

Adolescent Submissive Behavior Scale - ASBS (44,45). The language used in this scale was adapted from the adult version and is composed of 12 items, rated on a Likert-type frequency scale ranging from 1 (never) to 5 (always), and measures the frequency of submissive behaviors manifested by youths in their everyday lives. Scores can range from 0 to 60, where higher values indicate more frequent submissive behavior. The scale has a Cronbach's alpha (α) of .73 both on the original and the current study.

Other as Shamer Scale - OAS (46,47). This scale measures the current levels of external shame and comprises 18 items with a Likert-type frequency scale, ranging from 0 (never) to 4 (always). Scores can vary between 0 and 72, where higher values indicate higher levels of shame, or that individuals consider that they appear poorly in the eyes of others. The original and Portuguese validation studies of the scale presented a high internal consistency, with a Cronbach's alpha (α) of .92. In the present study, the Cronbach's alpha (α) for the total scale was 0.96, showing good internal consistency of the scale.

Depression, Anxiety, and Stress Scale - DASS-21; (48,49). This scale comprises 21 items describing symptoms experienced over the past month, divided in 3 dimensions, with 7 items each: depression, anxiety and stress. The items are rated in a Likert-type scale from 0 "it did not apply to me at all" to 3 "it applied to me very much". The original and Portuguese versions presented a good internal consistency for the Depression (original version: α = .94; Portuguese version: α = .85), Anxiety (original version: α = .87; Portuguese version: α =.74) and Stress (original version: α = .91; Portuguese version: α = .81) dimensions (48,49). In the current study, internal consistencies were: Depression: α = .91, Anxiety: α =.86, Stress α = .89).

2.3. Statistical analysis

Data was analyzed using IBM SPSS v. 20.0. Descriptive statistics are presented in the first part of the study, followed by bivariate correlation analysis and t-tests for independent samples for all continuous and categorical variables included in the current study. Because of the statistical power of analyses with large samples, effect sizes were calculated to aid the distinction between statistical significance with more practical implications from statistical significance due to tests sensitivity. Odds ratios were also calculated to assess for categorical variables and logistic regression analyses were calculated in order to address the predictive value of each variable relevant to NSSI and Suicide Ideation. Missing data analysis of the variables in this study showed that missing values were random and no variables had 5% or more missing values, and were imputed with the series mean method.

3. Results

3.1. Sample characteristics

A sample of 1763 adolescent, with ages between 14 and 22 years old (M = 16.75, SD = 1.31), 830 males (47.1%) and 933 females (52.9%) was recruited from high schools in the São Miguel island, Azores (see table 1). Participants had spent an average of 10.48 years in school (SD = 1.31). Socioeconomic status (SES) was estimated from parents' professional situation, and in 117 (6.6%) of cases, it was not possible to estimate socioeconomic status due to missing data.

Suicide ideation was reported by 387 (22%) of participants from the total sample. In the complete sample, gender differences were found in the scores of suicide ideation, although presenting small effect sizes: Girls presented significantly higher scores on suicide ideation than boys (M_{Fem} = 2.85; SD_{Fem} = 2.24; M_{Male} = 2.11; SD_{Male} = 2.15; $t_{(6,1761)}$=-7.022; p=.000, d = -0.33). Boys presented significantly higher scores in impulsivity (M_{Fem} = 8.43; SD_{Fem} = 4.20; M_{Male} = 9.22; SD_{Male} = 4.24; $t_{(6,1761)}$=3.927; p=.000, d =0.18) and risk behaviors(M_{Fem} = .71; SD_{Fem} = 1.7; M_{Male} = 1.4; SD_{Male} = 2.7); $t_{(6,1761)}$=7.053; p=.000, d = .007). No differences were found between genders regarding scores on NSSI behaviors (M_{Fem} = 1.22; SD_{Fem} = 2.94; M_{Male} = 1.39; SD_{Male} = 3.37; $t_{(6,1761)}$=1.105; p=.269), nor the functions of NSSI behaviors (M_{Fem} = 1.94; SD_{Fem} = 4.06; M_{Male} = 1.86; SD_{Male} = 3.94; $t_{(6,1761)}$=-.420; p=.675 for automatic reinforcement and M_{Fem} = .27; SD_{Fem} = .85; M_{Male} = .36; SD_{Male} = 1.02; $t_{(6,1761)}$=-1.826; p=.065 for social reinforcement).

From this sample, 521 (29.5%) participants report at least sometimes having endorsed in one form of NSSI behavior. Therefore, participants were separated in Non-NSSI and NSSI groups for a more specific description of NSSI behaviors and related variables. Participants who engage in NSSI tended to belong to a lower SES when compared to their non-NSSI counterparts and this difference in distribution has reached statistical significance, but with a small effect size. The remaining variables also

presented statistically significant differences between groups, with different effect sizes.

Sample characteristics regarding the variables in this study are presented in the table 1.

(insert table 1 here)

3.2. Characterization of NSSI

Considering the absence of significant differences in gender distributions and that the

gender of participants did not constitute an increased risk to NSSI (OR = 1.014, CI = [.

826-1.245]), the following analysis included boys and girls that endorsed in NSSI

behaviors. Participants were able to rate the frequency with which they used each NSSI

method, and table 2 presents the ISSIQ-A NSSI subscale items that refer different

methods used when practicing NSSI: in the current sample, biting was the most

frequently use method of self-harm, endorsed by 67.17% of the participants. The least

used method was swallowing objects or noxious substances, with 14.77% of the

participants having resourced to this method of NSSI.

(insert table 2 here)

As stated earlier, different motives underlying self-harm can co-exist. Concerning their

functions, assessed in the extra modules of the ISSIQ-A, 80% (417 participants) report

using self-harm as an automatic reinforcement, that is, in order to exert control or

regulate more disruptive emotional states. In addition, 41.8% (218) of the participants

reported using self-harm also with functions relating to social reinforcements or, in

other words, to control or manipulate their social environments and interactions.

Taking into account that most participants resource to NSSI behaviors with functions

associated with emotional regulation or control, the associations between NSSI and

suicide ideation and disruptive emotional states, self-criticism and psychopathological

symptomatology was explored. As presented in table 3, self-harm presented a moderate correlation to the engagement in risk behaviors and impulsivity, and significant but weaker correlations to suicide ideation, as suggested by previous results. In addition, moderate correlations between Self-harm and the more severe form of self-criticism (feelings of hatred towards the self), shame and depressive and anxious symptomatology were found. Concerning suicide ideation, the strongest correlations were found with depressive symptoms and shame, followed by severe forms of self-criticism (hated self and inadequate self) and anxiety and stress symptoms. As expected, the ability to be self-reassuring in the face of adversities presented a negative association with self-harm and suicidal ideation, with a more expressive association with the latter. Significant but weaker correlations were found between NSSI, Suicide ideation and adverse childhood memories, and early experiences of warmth and safeness presented a negative and moderate correlation with suicide ideation.

(Insert table 3)

3.3. Proximal and distal predictors of NSSI and suicide ideation

Lastly, a logistic regression with Forward LR method was calculated for the total sample (N = 1763), including distal and proximal factors in separate blocks. In other words, factors that referred to events that took place in the past (during childhood) or closer in time (experienced recently or in the present). Distal predictors entered in the first block included positive and adverse childhood experiences measured by EMWSS and CECA-Q subscales, and proximal predictors in the second block included submissive behavior, risk-behavior, impulsivity, self-criticism and self-reassurance, anger, external shame, depressive, anxiety and stress symptomatology. In addition to the

statistically significant differences found between groups presented on table 1, prior to analysis, the existence of weak or moderate statistically significant correlations between the variables to be entered as predictors of NSSI and suicide ideation were verified. Results for the first logistic regression, distinguishing participants with and without NSSI, indicated that Risk Behaviors ($b_{Risk\ Behaviors}$ = .414; X^2_{Wald} (1) = 79.627; $p <$ 0.001), anger (b_{AQ_Anger} = .270 X^2_{Wald} (1) = 5.618; p = 0.018), and Hated self ($b_{Hated\ Self}$ = .117; X^2_{Wald} (1) = 32.500; $p <$ 0.001) presented a stronger and statistically significant effect over the probability logit of a given occurrence (NSSI), followed by suicide ideation ($b_{SuicideId}$ = .105; X^2_{Wald} (1) = 7.558; p = 0.006), anxiety symptoms($b_{EADS\_Anxiety}$ = .042; X^2_{Wald} (1) = 4.940; p = 0.026) and submissive behavior (b_{ASBS} = .033; X^2_{Wald} (1) = 8.171; p = 0.004),. The adjusted Logit model was statistically significant (G^2 (8) = 17.318; $p <$ .001; R^2_{CS} = .273 ; R^2_N = .382). A new model was adjusted with the Forward LR procedure, including the significant predictors in the former model: Risk Behavior, Hated Self, Submissive Behavior, Anger and Anxiety. The model was statistically significant (G^2 (8) = 21.179.; p =0.007; R^2_{CS} = .262; R^2_N = .373). The adjusted logistic regression model presented on table 4 presents 78.1% of correct classifications of participants with and without NSSI behaviors. The model also presented good sensibility (44.3%) and high specificity (92.1%), indicating the model's utility to classify both populations, with good discriminant ability (AUC = .830; $p<$ 0.001).

(insert table 4)

The same analyses were carried out for suicide ideation in the total sample, grouping participants according to the presence or absence of suicide ideation. The resulting

regression model Results for the logistic regression, distinguishing participants with and without suicide ideation, indicated that Depressive symptoms presented a stronger and statistically significant effect ($b_{EADSDepression}$ = .159; $X^2_{Wald}(1) = 19.401$; $p < 0.001$) over the probability logit of a given occurrence (Suicide Ideation), followed by risk behaviors($b_{RiskBehavior}$ = -.099; $X^2_{Wald}(1) = 9.494$; $p = 0.002$), stress symptoms(b_{Stress} = .085; $X^2_{Wald}(1) = 9.474$; $p = 0.002$), Reassured self($b_{ReassuredSelf}$ = -.043; $X^2_{Wald}(1) = 9.983$; $p = 0.002$), Inadequate Self($b_{InadequateSelf}$ = .040; $X^2_{Wald}(1) = 13.774$; $p < 0.001$), external shame(b_{OAS} = .026; $X^2_{Wald}(1) = 13.965$; $p < 0.001$), neglect from Father($b_{FatherNegl}$ = -.024; $X^2_{Wald}(1) = 4.014$; $p = .045$), and early memories of warmth and safeness (b_{EMWSS} = -.017; $X^2_{Wald}(1) = 5.282$; $p = 0.022$). The adjusted Logit model was statistically significant ($G^2(8) = 15.822$; $p = 0.045$; $R^2_{CS} = .204$; $R^2_N = .314$). The new model was adjusted with the Forward LR procedure, including the significant predictors in the former model. The model was statistically significant ($G^2(8) = 16.526$.; $p = 0.035$; $R^2_{CS} = .204$; $R^2_N = .314$). The adjusted logistic regression model presented on table 5 presents 81.5% of correct classifications of participants with and without suicide ideation. The model also presented acceptable sensibility (33.6%) and high specificity (94.9%), indicating the model's utility to classify both populations, with good discriminant ability (AUC = .740; $p < 0.001$).

(insert table 5)

4. Discussion

The main goal of the current study was to characterize non-suicidal self-injury behaviors and suicide ideation in the adolescent population of S. Miguel Island. This study has also aimed to explore the relationship between NSSI and other variables referred in the current literature: suicide ideation, impulsivity, risk behavior, self-

criticism, disruptive emotional states such as anger and shame, and psychopathological symptomatology.

The prevalence rates of NSSI in youths in recent studies are alarmingly high, however, some studies point out to unclear distinctions between NSSI and suicidal ideation and behaviors, and that these prevalence rates may be also inflated by their association with risk behavior (9,29,50). As suggested by the results of the current study, the different frequencies and tendencies observed in NSSI and risk behaviors justify the distinction of these two behaviors (23,51). Thus, self-harm was considered in a stricter sense and a clear distinction between these behaviors was taken into account, in order to obtain a more reliable estimate of the NSSI phenomenon. Even so, the percentage of adolescent resourcing to self-harm was high: results suggested that approximately 30% of adolescents having endorsed in at least one self-harming behavior, a percentage that was twice as high as the percentages found by Matos et al. (30) and the 21.7% presence of at least one NSSI behavior over the lifetime of youths from the mainland (20). In fact, 6% to 23% of these youths having reported to resort to NSSI behaviors regularly ("often" or "always") and over 65% of participants report biting as the main method to self-injure.

Most participants that report NSSI behaviors come from a lower socioeconomic background, a factor that can significantly hinder the access to health care, education, reflecting a trend that is generally observed in mental health research in regions with significant societal problems like the Azores. This may explain the somewhat discrepant findings to other studies comparing rural with urban populations in which urban population presented increased rates of NSSI (52). These results may be due to psychosocial factors (e.g. social isolation, access to employment/education, problems at home) having a bigger influence than geographical or demographical (urban vs. rural, population density) factors alone (52). Consistent with this hypothesis, findings indicate

that the presence of NSSI was associated mainly with risk-behaviors, severe forms of self-criticism and negative emotions (shame and anxiety). Results also point out to NSSI behaviors' functions relying predominantly on automatic reinforcement, with the purpose of regulating emotionally disruptive states, that is, to create a desired emotional state or to cease unwanted feelings and emotions, consistent with recent biological findings on emotional regulation systems (53). It is possible that biting is the most predominant form of NSSI, not only because it is a more immediately available method, but possibly because it is a less criticizable/visible form of regulating one's emotion. Youths seem to prefer methods that allow a more immediate engagement in NSSI, without needing to wait for a particular opportunity and availability of instruments (such as knives, box cutters, access to toxic substances etc.) for self-harming and bringing relief from disruptive emotional states. It is arguable that the negative reinforcement provided by the NSSI can be involved the escalation of NSSI in terms of frequency, severity and method used for self-harming, constituting a particular aggravating risk factor to adolescents who have previously engaged in any form of NSSI.

It is widely accepted that adolescence is a period where a wide range of experimentations and learning take place, and the characteristic vulnerabilities of this developmental phase are partially justified by processes governed mainly by a fully-developed limbic system as the pre-frontal areas of the cortex continue to develop until individuals reach adulthood (54,55). This may explain the higher endorsement in NSSI behaviors in younger participants, although the differences in coping and other mechanisms involved in the origins and maintenance of NSSI behaviors need to be further explored in different age ranges. Nevertheless, at any developmental stage, self-harming behaviors are still a maladaptive coping strategy when disruptive emotional

states arise and the escalation of this behavior may increase to more severe forms, especially when associated with impulsivity and risk or disruptive behaviors, as suggested by our findings. In addition, higher frequencies of NSSI were associated with increased levels of suicidal ideation, in accordance to what was suggested by Joiner (26) and other studies in clinical samples (16,52,56,57). Analyses of the distal and proximal factors that predict the occurrence of NSSI showed that specific behavioral and emotional proximal factors are involved in the occurrence of NSSI: a model including the presence of risk and submissive behavior, anger, anxiety, severe self-criticism and suicide ideation support the hypothesis that NSSI can arise as a coping mechanism with more dysfunctional emotional states and interpersonal strategies also in community samples.

Concerning suicide ideation, individuals who self-harm presenting higher scores on suicide ideation presented stronger associations with depression, shame, severe self-criticism, stress, anxiety and moderate forms of self-criticism (feelings of inadequacy). It is important to emphasize that NSSI behaviors were not among the predictors of suicide ideation, despite both variables presenting significant (but weak) association. Should these results be consonant with findings in clinical samples in which NSSI is used as a strategy to cope with suicide ideation or inhibit suicide attempts (57), this predictive power would possibly be significant and negative. It is arguable that NSSI may have different purposes or interact with different processes, especially in the presence of psychiatric problems, as both phenomena appear to be more likely to occur as one advances in the psychopathology continuum. However, as advocated by Claes and colleagues (16), our current knowledge is still insufficient and drawing this line it may be a matter of interpretation in which wishing to end one's life can be regarded as the ultimate way to escape an aversive situation. Thus, the functional analyses and

search for interactions with psychopathological and biological processes (53,58) should

be a particular concern for future research and mental health practitioners carrying out

evaluation and treatment of NSSI and suicide ideation in their patients.

The strongest predictor of suicide ideation in youths was depressive symptomatology,

consistent with previous findings (29), in addition to self-criticism leading to feelings of

inadequacy, external shame, stress and memories of being neglected by the father

figure. Results also showed that, concerning suicide ideation, memories of warmth and

safeness and the ability to reassure the self have emerged as significant predictors which

may act as a protective factor due to their negative effect on suicide ideation and

positive impact on resilience and wellbeing (59–61). Curiously, risk behaviors also

emerged as the second strongest predictor in a negative sense. Risk behaviors in

adolescence often occur in groups and, despite the negative consequences that may arise

from those behaviors, risk behaviors should be thought to occur within a context that

may provide gains ,as the increased sense of belonging, which is incompatible to

feelings of inadequacy, isolation and depression experienced by most individuals with

severe suicide ideation. This also emphasizes the relevance of separating risk behaviors

or risk taking from NSSI and results show that more refined studies are needed in this

regard (54,62,63). Despite the possible continuity or escalation between risk behavior,

NSSI and suicidal ideation and behaviors, current findings emphasize that they refer to

distinct phenomena and encompass a distinct interplay between distal and/or proximal

risk factors, as well as a possible differential role in the protective factors affecting the

degree of suicide ideation and NSSI.

Research findings reinforce the importance of developing self-compassion and the

ability to tolerate the negative feelings and emotions in interventions with youths, to the

extent that developing skills to soothe the self and cope with self-criticism (feelings of

inadequacy, disgust or hate towards the self) may have a positive impact both on NSSI and suicidal ideation, as suggested by Gilbert et. al (17). In consonance with other findings, the current study draw's our attention to the high price of isolation and increased vulnerability of youths living in the more peripheral and impoverished areas of Europe, which also involve additional obstacles to mental health care access (64). These findings should draw the attention of mental health professionals, local and EU policy-makers and stakeholders to the need to understand and address the specificities of these populations more adequately not only on an intervention basis, but on preventive levels. In the current study, it became clear that proximal factors such as engagement in risk behaviors, severe forms of self-criticism, feelings of anger, shame, anxiety and submissiveness explain a significant amount of the variance in the worrisome frequencies of engagement in NSSI behaviors of these youths, that were also present in previous studies (7,14,16,17,63,65). In addition, reinforcement resulting from NSSI behaviors may act as a maintenance factor of this maladaptive behavior, rendering it more stable over time.

This first effort to characterize the Azorean youths presents limitations and raises several questions that should be addressed in future studies. Methodologically, the use of self-report measures and the cross-sectional design requires caution on the implication of causality among variables and may induce bias in the estimation of NSSI behaviors by the respondents: while social desirability may influence youths to underestimate the practice or frequency of NSSI, on the other hand, the anonymity of the self-report forms may allow youths to respond more sincerely and less fearful of stigmatization. The effect of these factors in the possible under or overestimation of NSSI rates are unknown. Despite these limitations, the current study allows to a more systematized and complete knowledge of self-harm behavior in adolescents in a

representative sample of youths attending to mandatory education in S. Miguel Island. Future studies – resourcing to different assessment methods, such as interviews and screening procedures, and with longitudinal designs – may allow a clearer understanding of the causes of NSSI behaviors in this particular population. It would be of significant interest to further explore possible gender differences found in the current sample regarding suicide ideation (66,67), to study the relationship of coping strategies and the processes underlying self-harming behaviors in different age ranges, clinical samples and to carry out cross-cultural comparisons, in addition to comparative studies of youths living in isolated communities and on the mainland areas that share a common cultural background.

This constitutes an important step in understanding the phenomenon and needs of youth engaging in NSSI and presenting suicide ideation, allowing more adequate and specific interventions to be designed in order to more effectively address these issues. For instance, implementing socio-emotional skills development programs for youths in school settings where NSSI and suicide ideation has been identified, in addition to the development of therapeutic plans (68), contemplating emotional regulation strategies and self-compassion in clinical settings are considered best practices (6). Research on the efficacy of different approaches and specific strategies in reducing NSSI and suicide ideation in youths should also not be disregarded when providing more structured responses to this overarching issue afflicting our youths.

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Table 1.

Sample characteristics (N = 1763)

	Total (N=1763)	Non-NSSI (n = 1242)	NSSI (n = 521)				
		N (%)	N (%)	X^2	p	V	p
Gender							
Male	830 (47.1)	586(47.1)	244 (46.8)	.018	0.890	.003	0.917
Female	933 (52.9)	656 (52.9)	277 (53.2)				
SES							
Low	990 (56.4)	679 (58.33)	311 (64.52)				
Medium	523 (29.6)	386 (33.16)	137 (28.42)	9.830	0.040	.77	0.043
High	133 (7.5)	99 (8.50)	34 (7.05)				
		M(SD)	M(SD)	t	p	d	Effect size
Age	16.75 (1.31)	16.85 (1.32)	16.53 (1.24)	4.747	0.000	.24	S
Years of education	10.48 (1.31)	10.60 (1.27)	10.20 (1.37)	5.841	0.000	.30	S
CECA-Q							
Mother's Antipathy	16.72 (5.18)	16.08 (4.96)	18.23 (5.37)	-7.848	0.000	-.42	S
Father's Antipathy	17.72 (5.68)	16.88 (5.31)	19.72 (6.04)	-9.355	0.000	-.60	M
Mother's Neglect	28.30 (3.78)	28.54 (3.56)	27.70 (4.21)	3.988	0.000	.22	S
Father's Neglect	25.43 (6.03)	25.88 (5.87)	24.37 (6.27)	4.682	0.000	.24	S
EMWSS	60.86 (12.99)	62.95 (11.70)	55.89 (14.46)	9.872	0.000	.53	M
ISSIQ-A							
Impulsivity	8.81 (4.24)	8.00 (4.10)	10.72 (3.95)	-12.835	0.000	-.67	M
Risk-behaviors	1.07 (2.28)	.51(1.25)	2.40 (3.37)	-12.435	0.000	-.74	L
Suicide ideation	2.50 (2.23)	2.03 (1.93)	3.64 (2.49)	-13.098	0.000	-.72	L
NSSI	1.30 (3.15)	-	4.41 (4.47)	-22.505	0.000		
Automatic Reinforcement	1.91(4.00)	-	5.67 (5.34)	-22.377	0.000		
Social Reinforcement	.31 (.93)	-	.93 (1.43)	-13.801	0.000		
ASBS	29.0 (6.95)	28.04 (6.70)	31.29 (7.01)	-8.970	0.000	-.47	S
AQ – Anger	2.57 (.72)	2.44 (.71)	2.87 (.67)	-11.786	0.000	-.62	M
FSCRS							
Inadequate	18.58 (7.06)	17.28 (6.95)	21.67 (6.32)	-12.881	0.000	-.66	M
Hated Self	4.25 (4.29)	3.07 (3.44)	7.06 (4.77)	-19.648	0.000	-.95	L
Reassured self	21.76 (6.04)	22.70 (5.73)	19.51 (6.19)	10.074	0.000	.53	M
External Shame	21.63 (14.07)	18.70 (12.67)	28.60 (14.72)	-13.410	0.000	-.72	L
Depression	4.50 (4.89)	3.49 (4.1)	6.89 (5.62)	-12.395	0.000	-.69	L
Anxiety	3.91 (4.24)	3.02 (3.57)	6.03 (4.93)	-12.584	0.000	-.70	L
Stress	5.46 (4.79)	4.55 (4.35)	7.61 (5.08)	-12.029	0.000	-.65	M

Note: SES = Socioeconomic status; NSSI = Non Suicidal Self Injury; CECA-Q = Childhood Experiences of Care and Abuse Questionnaire; EMWSS = Early Memories of Warmth and Safeness Scale; ISSIQ-A = Impulse, Self-harm and Suicide Ideation Questionnaire for Adolescents, ASBS = Adolescent Submissive Behavior Scale; AQ = Aggression Questionnaire; FSCRS = Forms of Self Criticizing/Attack and Reassuring Scale; S = Small; M = Medium; L = Large.

Table 2.

Methods and frequency of self-harm endorsed by participants with NSSI (n = 521)

	Never N (%)	Reported N (%)
I hurt myself on purpose	238 (45.7%)	283 (54.3%)
Hitting (the head, hands or other body parts, running against things)	288 (55.3%)	233 (44.7%)
Scratching and pinching	266 (51.1%)	255 (48.9%)
Biting (parts of the body or objects)	171 (32.8%)	350 (67.1%)
Cutting (with blades, scissors, knives, etc.)	352 (67.6%)	169 (32.4%)
Burning (with cigarettes, lighters, oven, etc.)	417 (80.0%)	104 (20.0%)
Sticking needles or other objects in the body	422 (81.0%)	99 (19.0%)
Swallowing/introducing pointed objects or substances	444 (85.2%)	77 (14.7)

Table 3.

Correlations between self-harm, suicide ideation, and anger, shame, self-criticism, self-reassurance, psychopathological symptomatology and childhood memories (n = 1763)

	Inade-quate self	Reassu-red self	Hated self	AQ Anger	OAS	SBS	Depres sion	Anxiet y	Stress	Impul-se	Risk-Behavi or	NSSI	EMWS S	Antip. Father	Antip. Mother	Neglect Father	Neglect Mother
NSSI	.231**	-.188**	.427**	.263**	.316**	.210**	.342**	.353**	.288**	.335**	.632**	-	-.203**	.207**	.196**	-.068*	-.050*
Suicide Ideation	.479**	-.382**	.500**	.349**	.548**	.290**	.611**	.474**	.494**	.307**	.152**	.312**	-.459**	.272**	.267**	-.181**	-.165**

Note: AQ – Aggression Questionnaire; OAS – Other as Shamer Scale; SBS – Sumissive Behavior Scale; EMWSS – Early Memories of Warmth and Safeness Scale; Antip. = Antipathy
* *p* < 0.05 (2-tailed)
** *p* < 0.01 (2-tailed)

Table 4

Logit coefficients from the logistic regression model for NSSI (N = 1763)

Dimension	B	S.E.	X^2_{Wald}	df	p	Exp(B)
FSCRS Hated Self	0.145	.016	69.891	1	0.000	1.156
EADS Anxiety	0.040	.011	5.905	1	0.015	1.041
Submissive Behavior Scale	0.028	.010	7.889	1	0.005	1.028
AQ Anger	0.268	.410	7.609	1	0.006	1.307
ISSIQ-A Risk Behaviors	0.385		102.220		0.000	1.470
ISSIQ-A Suicide Ideation	0.105		10.331		0.001	1.111
Constant	-3.991		115.808		0.000	0.018

Table 5

Logit coefficients from the logistic regression model for Suicide Ideation (N = 1763)

Dimension	B	S.E.	X^2_{Wald}	df	p	Exp(B)
EMWSS	-.017	.007	5.513	1	0.019	.983
Father's Neglect	-.024	.012	4.072	1	0.044	.976
EADS Depression	.159	.036	19.416	1	0.000	1.173
EADS Stress	.085	.028	9.460	1	0.002	1.089
OAS External Shame	.026	.007	14.021	1	0.000	1.026
ISSIQ-A Risk Behavior	-.098	.032	9.542	1	0.002	.907
FSCRS Inadequate Self	.040	.011	14.281	1	0.000	1.041
FSCRS Reassured Self	-.043	.014	10.186	1	0.001	.958
Constant	2.122	.570	13.857	1	0.000	8.350