Longitudinal pathways for the maintenance of non-suicidal self-injury in

adolescence: The pernicious blend of depressive symptoms and self-criticism

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Abstract

BACKGROUND: Non-suicidal self-injury is a serious and alarming phenomenon

during adolescence. There is a need for understanding the intrapersonal variables that

might contribute to the maintenance of these self-injurious behaviors.

OBJECTIVE: This study aims to concurrently compare intrapersonal variables between

adolescents with and without a lifetime history of non-suicidal self-injury, and to

longitudinally test whether non-suicidal self-injury over lifetime history predicts 6-

months non-suicidal self-injury through self-criticism and depressive symptoms among

Portuguese adolescents with a self-reported history of non-suicidal self-injury.

METHODS: Adolescents ($N = 418$, 12-19 years-old) from middle and secondary

schools completed self-report questionnaires to assess self-criticism (particularly, the

most severe form: hated self), depressive symptoms, and the frequency of non-suicidal

self-injury in two points in time over the 6-month interval.

RESULTS: Adolescents who reported a lifetime history of NSSI tend to experience greater harsh and persecutory criticism towards themselves and elevated depressive symptoms than adolescents without a history of NSSI. Results from path analysis showed that lifetime non-suicidal self-injury predicts subsequent non-suicidal self-injury, and this association is mediated by self-hatred and depressive symptoms among adolescents with lifetime non-suicidal self-injury.

CONCLUSIONS: Findings suggest that non-suicidal self-injury is maintained through a sense of self-focused on hatred and disgust feelings and depressive symptoms.

Keywords: adolescence; depression; longitudinal; self-criticism; non-suicidal self-injury.

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Adolescence is a developmental period with elevated risk for non-suicidal self-injury (Klonsky, Muehlenkamp, Lewis, & Walsh, 2011). Non-suicidal self-injury (NSSI) is the direct and intentional destruction of one's body tissue (e.g., repetitive cutting, burning), conducted neither with lethal intent nor in adherence to religious or cultural customs (American Psychiatric Association, 2013). In community samples of adolescents (aged 12-18), the lifetime prevalence of NSSI ranges between 10% and 40% (Giletta, Scholte, Engels, Ciairano, & Prinstein, 2012; Klonsky et al., 2011). NSSI typically first occurs in adolescence with an average age of onset between 12 and 16 years old (Klonsky et al., 2011). Regarding gender differences, a recent meta-analysis indicated that females were significantly more likely to report a history of NSSI than males across several studies with adolescent and adult samples (Bresin & Schoenleber, 2015). In addition, NSSI is associated with various psychopathological indicators (e.g., personality disorders, internalizing and externalizing symptoms), and is a strong predictor of suicidal thoughts and behaviors, and can often persist into adulthood (Klonsky, May, & Glenn, 2013; Klonsky et al., 2011).

Theoretical frameworks and several empirical studies converge to the consensus that NSSI is mainly motivated by seeking relief from intense emotional distress or escaping from a situation (e.g., Chapman et al., 2006; Klonsky, 2009; Nock, 2009, 2010; Nock & Prinstein, 2004). Thus, in the face of intense negative emotions, individuals try to manage or escape from this emotional activation and engage in NSSI, which quickly reduces or eliminates this intense and undesirable emotional activation and produces an immediate emotional relief. In a vicious cycle, repeated negative reinforcement strengthens the association between emotional activation and NSSI, such

that NSSI automatically occurs in similar situations and is maintained over time (Chapman et al., 2006; Nock & Prinstein, 2004).

Although research supports that NSSI is mainly used as a maladaptive means of coping with intense or unpleasant emotions, both interpersonal (e.g., stressful interactions with family and peers; Jutengren, Kerr, & Stattin, 2011; Xavier, Cunha, & Pinto-Gouveia, 2016a) and intrapersonal factors are implicated in initiation and maintenance of NSSI (Klonsky, 2009; Nock, 2009; Nock & Prinstein, 2004). For instance, Hankin and Abela (2011) in a sample of adolescents (11-14 years old) found that maternal and youth depressive symptoms, low social support, and negative cognitive style predicted new engagement in NSSI over 2 ½ years. Similarly, two studies (Andrews, Martin, Hasking, & Page, 2014; Tatnell, Kelada, Hasking, & Martin, 2014) demonstrated that the combination of intra- and interpersonal variables seems to influence the onset of NSSI among school-based adolescents, namely lower self-esteem, female gender, higher attachment anxiety, poor problem solving, greater psychological distress, and lower perceived family support. Another longitudinal study conducted with a clinical sample ($N = 143$; 12-15 years-old) showed that adolescents who experience greater stressful interpersonal life events and perceive these stressful life events with a negative attributional style are not only at risk for depressive symptoms, but also for engagement in NSSI $1^{1/2}$ years later (Guerry & Prinstein, 2009).

Regarding the risk factors for continuation of NSSI, Andrews, Martin, Hasking, and Page (2013) found in a large sample of Australian school-based adolescents (12-18 years old) that higher frequency of NSSI and difficulties in emotion regulation (particularly, poor cognitive reappraisal and higher emotional suppression) are associated with the maintenance of NSSI over one year. Another study, conducted with young adult self-injurers, revealed that past NSSI (including the frequency, methods,

and recency of NSSI at the beginning of the study), participants' prediction of their engagement in future NSSI, and Borderline Personality Disorder features prospectively predicted NSSI (Glenn & Klonsky, 2011). Similarly, among young adults with a history of self-cutting, the major predictors of future NSSI were prior NSSI, the number of NSSI methods, and lower aversion to self-cutting stimuli (Franklin, Puzia, Lee, & Prinstein, 2014).

Indeed, a large body of research has demonstrated that the past and repeated NSSI is often one of the strongest predictors of future NSSI (e.g., Fox et al., 2015; Guerry & Prinstein, 2009; Lundh, Wångby-Lundh, & Bjärehed, 2011; Marshall, Tilton-Weaver, & Stattin, 2013). Despite the robustness of prior NSSI to predict future self-injurious behaviors, other additional factors have been studied. For instance, depressive symptoms concurrently and prospectively predicted the engagement in and maintenance of NSSI among adolescents (Marshall et al., 2013; Lundh et al. 2011), especially for those with high risk for NSSI (Prinstein et al., 2010). Empirical literature largely demonstrates that the prevalence of depressive symptoms increases in adolescence, especially in females (e.g., Nolen-Hoeksema & Girgus, 1994).

Among cognitive vulnerability factors for NSSI, self-derogation or self-criticism also plays a key role in NSSI (Klonsky et al., 2011; Nock, 2009, 2010). Adolescents who self-injure consistently report higher levels of critical and persecutory attitudes towards themselves and lower self-esteem (Glassman et al., 2007). Additionally, self-punishment is also a reason to engage in NSSI (e.g., "to punish myself", "to express anger at myself"; Klonsky et al., 2011; Nock, 2009, 2010; Nock & Prinstein, 2004). According to Gilbert and colleagues (2004), self-criticism refers to an internal hostile self-to-self relationship characterized by negative self-judgment and self-evaluation, mainly in response to perceived failure or personal inadequacies. Research suggests that

self-criticism is associated with negative emotions, particularly sadness, shame, contempt and disgust for the self, and with defensive and submissive behaviors (Gilbert et al., 2004; Whelton & Greenberg, 2005). Such internal relationship of self-persecuting or self-attacking is an internalized process derived from social interactions, usually early negative relationships with parents (Baetens et al., 2015; Glassman et al., 2007; Xavier, Pinto-Gouveia, Cunha, & Carvalho, 2016). Indeed, self-criticism is linked to the same neurophysiological systems as criticism generated externally by others (Longe, Maratos, Gilbert, Evans, & Volker, 2010). Additionally, individuals with high self-criticism tend to have an over-stimulated threat emotional system, with subsequently depressed affect, and underdeveloped capacities for self-reassuring and self-soothing (Gilbert, Baldwin, Irons, Baccus, & Palmer, 2006; Gilbert & Procter, 2006). Previous research shows that self-criticism is associated with several psychopathological conditions (e.g., mood disorder; personality disorders; eating disorders; self-harm; Castilho, Pinto-Gouveia, & Duarte, 2013; Claes et al., 2011; Gilbert et al., 2010) and is a strong vulnerability factor for depression (Zuroff, Igreja, & Mongrain, 1990). Furthermore, self-criticism is a stable characteristic from early adolescence to adulthood with reciprocal effects between this dispositional trait and depressive symptoms, especially for females (Shahar, Blatt, Zuroff, Kupermine, & Leadbeater, 2004).

According to biopsychosocial approach, self-criticism has different forms and functions (Gilbert, 2000; Gilbert & Irons, 2005). When self-criticism focuses on the attempt to self-improve or correct behaviors (a sense of personal inadequacy, i.e., inadequate-self) it seems to be less pathological than when it focuses on hostile and persecutory feelings towards the self (Gilbert et al., 2004). The *hated-self* refers to a sense of disgust, hatred, and anger with the self. Its underlying function is the desire to persecute, punish and exclude the self (Gilbert et al., 2004). Recently, a cross-sectional

study conducted in a school-based adolescents' sample (Xavier, Pinto-Gouveia, & Cunha, 2016b) indicated that this severe form of self-criticism (i.e., hated self) is strongly associated with NSSI. Thus, it seems that the dislike, hatred, and anger with the self are one reason to physically attack the self, even in the absence of depressive symptoms (Xavier et al., 2016b). Additionally, self-hatred proved to be a significant mediator between negative early environments and NSSI (Ammerman & Brown, 2016; Xavier et al., 2016c), despite the cross-sectional design of these studies.

In this vein, two experimental studies (Nock, Prinstein, & Sterba, 2009; Armey, Crowther, & Miller, 2011) elucidate about the emotional phenomenology of NSSI, by demonstrating that angry and hostile emotions (e.g., self-directed anger and shame) are higher in, and predictive of, a NSSI episode, especially for individuals who frequently engage in NSSI. In addition to this emotional intensity, individuals who self-injure are willing to endure pain because they have negative cognitions about themselves (e.g., defective, bad) and they believe that they deserve punishment (Hooley, Ho, Slater, & Lockshin, 2010). However, the self-punishment hypothesis for understanding why individuals inflict harm upon themselves remains underexplored, particularly in adolescence (Nock, 2010). Although current literature demonstrates that self-criticism and depressive symptoms are related to the presence of NSSI, there is a paucity of longitudinal studies that explore the potential of these intrapersonal factors for the maintenance of NSSI among adolescent samples with NSSI history (Fox et al., 2015). It is likely that individuals who have negative representations of themselves and struggle with hostile and critical self-views, would experience intense negative emotions and consequently use NSSI as a behavior to alleviate such cognitions and emotions. Thus, identifying intrapersonal factors that may explain the maintenance of NSSI (e.g., self-criticism, depressed affect) is greatly needed. Given that literature demonstrates

substantial gender differences in the variables under study (e.g., Bresin & Schoenleber, 2015; Nolen-Hoeksema & Girgus, 1994; Shahar et al., 2004), the current study will also consider possible interactions between self-criticism, depressive symptoms, NSSI, time and gender.

The current study aims to (i) compare mean scores on self-criticism (i.e., self-hatred), depressive symptoms, and lifetime NSSI between adolescents with and without a lifetime history of NSSI; (ii) analyze the interactions between variables under study, time and gender among adolescents with NSSI; (iii) analyze the longitudinal associations between depressive symptoms and self-criticism and non-suicidal self-injury; and (iv) test whether NSSI over lifetime history predicts 6-months NSSI through self-criticism (i.e., self-hatred) and depressive symptoms among adolescents with a self-reported history of NSSI. We predicted that lifetime history of NSSI would be longitudinally associated with NSSI at 6-months and that this relationship would be mediated by self-hatred and depressive symptoms. If supported, this previously untested hypothesis would provide useful information to understand the maintenance factors of NSSI and to develop preventive and intervention actions specifically designed for adolescents with NSSI.

Method

Sample recruitment

The sample recruitment was through non-probability sampling method (i.e., convenience sample). Nevertheless, participants were recruited from seven different independent schools.

Two waves of data (namely Time 1, T1 and Time 2, T2) were collected in the same adolescents during a period of 6 months in middle and secondary schools. At

Time 1, 538 adolescents (233 males, 43.3% and 305 females, 56.7%) in Grades 7 to 11

($M = 9.56$, $SD = 1.35$) participated in the beginning of the study. Participants enrolled in

wave 1 were between the ages of 12 and 19 years old ($M = 15.12$, $SD = 1.48$).

A total of 421 (78.3%) of these adolescents participated in the study 6 months

later (i.e., Time 2) in Grades 7 to 12 ($M = 10.44$, $SD = 1.43$). Adolescents from Time 2

were between the ages of 12 and 19 years old ($M = 15.65$, $SD = 1.39$). Attrition ($n =$

117, 21.7%) was mainly due to students transferring to other schools or absence from

school on the day of the assessment.

Missing data was verified through Little's (1988) Missing Completely at

Random (MCAR) test, and there was evidence of nonrandom missing data, X^2 (413) =

769.253, $p < .001$. As a result, all analyses were conducted only on the subsample of

adolescents with complete longitudinal data. Given that the purpose of this study is to

analyze the frequency of NSSI, three cases were excluded from the data set because

they have reported suicidal ideation and attempt in both times of assessment.

To analyze the first aim of the current study, this subsample of 418 adolescents

was divided into two groups: those with a history of NSSI and those without a history of

NSSI (measured at Time 2). Then, to test the second, third, and fourth objectives of this

study, those adolescents who had never engaged in NSSI measured at Time 2 ($n = 202$,

48.3%) were excluded from the subsample of 418 adolescents. This option was used

because we intend to analyze adolescents with a presence of lifetime history of NSSI in

the subsequent statistical analysis.

Participants

The final sample ($N = 418$) includes 177 males (42.3%) and 241 females

(57.7%). The mean age was 14.92 ($SD = 1.47$) at Time 1 and 15.64 ($SD = 1.39$) at Time

2. No gender differences were found for age at Time 1, $t_{(416)} = 1.352$, $p = .177$, nor at

Time 2, $t_{(416)} = 1.780$, $p = .076$. There were gender differences in years of education at Time 1, $t_{(361.317)} = 2.356$, $p = .019$, as well as at Time 2, $t_{(362.484)} = 2.481$, $p = .014$, indicating that females have more years of education than males (T1: $M = 9.62$, $SD = 1.35$ *versus* $M = 9.29$, $SD = 1.46$; T2: $M = 10.59$, $SD = 1.37$ *versus* $M = 10.24$, $SD = 1.48$).

The subsample of adolescents without a lifetime history of NSSI (henceforth referred to Non-NSSI group) is composed by 202 individuals, 102 of which are males (50.5%) and 100 are females (49.5%). At Time 1, the mean age of these adolescents was 14.81 ($SD = 1.53$) and the mean years of education was 9.40 ($SD = 1.42$). No gender differences were found for age, $t_{(200)} = 1.044$, $p = .298$, and years of education, $t_{(200)} = 1.232$, $p = .202$, at Time 1. At Time 2, these adolescents had a mean age of 15.53 ($SD = 1.43$) and a mean of years of education of 10.37 ($SD = 1.44$). No gender differences were found for age, $t_{(200)} = 0.941$, $p = .348$, and years of education, $t_{(200)} = 1.308$, $p = .192$, at Time 2.

The subsample of adolescents who reported a lifetime history of NSSI (henceforth referred to NSSI group) is composed of 216 individuals and includes 75 males (34.7%) and 141 females (65.3%). At Time 1, these adolescents had a mean age of 15.03 ($SD = 1.41$) and a mean of years of education of 9.56 ($SD = 1.39$). At time 2, these adolescents had a mean age of 15.75 ($SD = 1.36$). No gender differences were found for age, $t_{(214)} = 1.263$, $p = .208$, except for years of education, $t_{(214)} = 2.061$, $p = .041$, suggesting that females have more years of education than males ($M = 10.65$, $SD = 1.37$ *vs.* $M = 10.24$, $SD = 1.46$) at Time 2. The most common self-injured parts of the body endorsed by these adolescents were hands, arms, fingers, and nails ($n = 67$, 31%) followed by a combination of hands, arms, fingers and legs, feet, and toes ($n = 7$, 3.2%) and legs, feet, and toes ($n = 4$, 1.9%).

Design and Procedure

The current study has a longitudinal design with two points of assessment in an interval temporal of 6-months. After obtaining ethical approvals from the Portuguese Data Protection Authority and Ministry of Education, schools in the center region of Portugal were contacted to participate in the study. The Head Teacher and the parents were informed about the goals of this research and gave written informed consent. All adolescents enrolled in the study were fully informed about the goals of the study and that their participation was voluntary. A unique identifier number for each individual was created for data-matching purposes. Participants were assured strict confidentiality of the collected data and that only the researcher had access to the questionnaires. Adolescents consented to participate and filled out voluntarily the instruments in the classroom in the presence of the teacher and researcher. The researcher provided clarifications about the questionnaires when requested. Participants who did not want to participate or were not authorized by their parents were excluded and were given an academic task by the teacher in the classroom.

Measures

All measures were administered at T1 and then 6-months later at T2.

Self-criticism: Hated self

The **Forms of self-criticizing/attacking and self-reassuring scale (FSCRS**; Gilbert, Clark, Hempel, Miles, & Irons, 2004; Portuguese version: Castilho, Pinto-Gouveia, & Duarte, 2013) is a 22-item self-report questionnaire that measures individual's critical and reassuring self-evaluative responses to a setback or disappointment. This scale comprises two forms of self-criticizing (*inadequate self* and *hated self*), and other attitude focused on the positive aspects of the self (*reassured self*). Each item is rated on a 5-point scale (0 = *not at all like me*; 4 = *extremely like me*). In the current study, only

the *hated-self* subscale was used to capture disgust, dislike and anger feelings for the

self and an aggressive desire to hurt or persecute the self (5 items; e.g., "I have become

so angry with myself that I want to hurt or injure myself."; "I have a sense of disgust

with myself."). The Portuguese version presented good internal consistency in the adult

non-clinical sample (α = .72 for hated self; Castilho et al., 2013). Other studies

conducted with adolescent samples found Cronbach's alphas ranging between .79 and

.80 for hated self (Xavier et al., 2016b, 2016c). Cronbach's alpha for hated self in the

current study was .78 at T1 and .80 at T2.

Depressive symptoms

The **Depression Anxiety and Stress Scales** (DASS-21; Lovibond & Lovibond, 1995;

Portuguese version: Pais-Ribeiro, Honrado, & Leal, 2004) is a 21-item scale and

assesses three dimensions of negative emotional symptoms: depression, anxiety and

stress. The items are rated on a 4-point scale (0-3) during the last week. In the current

study, only depression scale was used to assess dysphoria, hopelessness, devaluation of

life, self-deprecation, lack of interest/involvement, anhedonia, and inertia (7 items; e.g.,

"I found it difficult to work up the initiative do to things."). The Portuguese version for

young adults the Cronbach's alpha for depression scale was .85 (Pais-Ribeiro, Honrado,

& Leal, 2004). In the current study depression scale presented good internal consistency

(α = .88) at T1 and T2.

NSSI

The **Risk-taking and Self-harm Inventory for Adolescents** (RTSHIA; Vrouva,

Fonagy, Fearon, & Roussow, 2010; Portuguese version: Xavier, Cunha, Pinto-Gouveia,

& Paiva, 2013) is a self-report questionnaire that measures simultaneously risk-taking

and self-harm behaviors. In the current study, only the Self-harm dimension was used to

assess the frequency of self-injury behaviors (e.g., cutting, burning or biting). The items

refer to *intentionally* self-injury behaviors to hurt the self or to hurt or punish the self and are rated on a 4-point scale (0 = *never*; 3 = *many times*), referring to the lifelong history. Individuals were classified as having a history of NSSI if they reported engaging in any NSSI behaviors one or more times. In the present study, items 32 and 33, which assess suicidal ideation and intent respectively, were not included in the overall sum of NSSI to obtain a continuous measure of non-suicidal self-injurious behaviors. In the Portuguese version, the self-harm dimension had good internal reliability (17 items: α = .89; Xavier, Cunha, & Pinto-Gouveia, in press). In the present study, the self-harm dimension (15 items) presented Cronbach's alphas of .89 at Time 1 and .88 at Time 2.

Conflict of Interest

Author A.X., Author J.P.G., Author M.C., and Author A.D. declare that they have no conflict of interest.

Data Analysis

All statistical analyses were performed using PASW Software (Predictive Analytics Software, version 22, SPSS, Chicago, IL, USA) and Amos Software (Analysis of Moment Structures, version 22, Amos Development Corporation, Crawfordville, FL, USA).

Descriptive statistics were computed to analyze demographic variables and means scores on all variables. First, we assessed cross-sectional differences at baseline (Time 1) on demographic and variables under study between adolescents with and without NSSI using independent samples t-tests and Pearson chi-square test. Second, a mixed between-within subjects' analysis of variance (ANOVA) was conducted to compare scores on the studied variables at Time 1 and Time 2 and to analyze whether the change in variable scores was different for males and females (Field, 2013), in the

subsample of adolescents with a lifetime history of NSSI. This analysis is justified by the fact that the literature reports gender differences in the variables under study (i.e., females are more likely to report higher levels of self-criticism, depression, and NSSI; Bresin & Schoenleber, 2015; Nolen-Hoeksema & Girgus, 1994; Shahar et al., 2004). Bonferroni correction for multiple comparisons was calculated in order to reduce type I errors ($p = 0.05/3 = 0.02$) (Field, 2013). Effect sizes were analyzed accordingly to Cohen's (1988) recommendations.

Pearson product-moment correlation coefficients were performed to explore the relationships between all variables in study among the subsample of adolescents with a lifetime history of NSSI. The strength of the relationships amongst variables was analyzed according to Cohen's guidelines (1988), recommending that correlations from .10 to .29 are small; .30 to .49 are medium; and .50 to 1.0 are large.

Path analysis from structural equation modelling (SEM) was performed to estimate the presumed relations among variables in the proposed theoretical model (Kline, 2005). The current study has two waves of data (i.e., Time 1 and Time 2), which is referred as half-longitudinal design (Cole & Maxwell, 2003). Such data will allow us to explore the relations between variables over time (Cole & Maxwell, 2003; Fritz & MacKinnon, 2012). The proposed mediation model enabled us to analyze whether NSSI at Time 1 would impact on NSSI at Time 2, mediated by Hated self at Time 2 and Depressive symptoms at Time 2. Depressive symptoms at Time 1 were also included in the model to statistically control for its potential confounding effect. This model was tested in the subsample of adolescents with a lifetime history of NSSI.

The Maximum Likelihood (ML) was used as the estimation method to test for the significance of all path coefficients in the models and to compute fit indexes statistics (Kline, 2005). The following standard criteria (Kline, 2005) were used to

estimate the overall model fit: *Goodness of Fit Index* (GFI ≥ .95, good), *Comparative Fit Index* (CFI ≥ .95, good), *Tucker-Lewis Index* (TLI ≥ .95, good), *Root Mean Square Error of Approximation* ($RMSEA$ ≤ .05, good fit; ≤ .08, acceptable fit; ≥ .10, poor fit), with 90% confidence interval (CI) (Hu & Bentler, 1999). Significant indirect effects were tested using the Bootstrap resampling method. This procedure with 2000 Bootstrap samples was used to create 95% bias-corrected confidence intervals (Hayes & Preacher, 2010; Kline, 2005).

Results

Preliminary Data Analysis

Data was screened for univariate normality, and there were no severe violations to normal distribution (|Sk| < 3 and |Ku| < 8-10; Kline, 2005). Multicollinearity was examined by inspecting the tolerance and variance inflation factor (VIF < 5) and no multicollinearity problems were found in the variables (Kline, 2005).

Differences between Non-NSSI and NSSI Groups at Time 1

Table 1 displays descriptive statistics for Non-NSSI and NSSI groups at baseline (Time 1) and differences between the groups. As can be seen in Table 1, regarding the comparison between Non-NSSI and NSSI groups, there is a significantly greater proportion of females reporting engagement in NSSI, with a small effect size. In addition, adolescents in the NSSI group endorsed significantly more levels of hated self, depressive symptoms, and lifetime NSSI frequency than adolescent without a history of NSSI. According to Cohen's recommendation (1988), the effect sizes were large (cf. Table 1).

Repeated-measures ANOVA and gender differences for NSSI group

The means and standard deviations of main study variables for the subsample of adolescents who reported a lifetime history of NSSI and for gender are presented in Table 2. Using Bonferroni correction for multiple comparisons significant results were considered when $p < 0.02$. Results from mixed design ANOVA showed that for hated-self scores there was a non-significant main effect for gender, $F (1, 214) = 3.323$, $p = .070$, suggesting that hated-self scores for genders were similar. There was also a non-significant main effect of hated self, $F (1, 214) = 3.116$, $p = .079$, suggesting that the pattern of hated-self scores was identical across time. Additionally, the interaction between hated self and gender was non-significant, $F (1, 214) = 0.391$, $p = .533$, indicating that ratings from male and female adolescents were similar across time.

Regarding depressive symptoms, results showed that there was a non-significant main effect of gender, $F (1, 214) = 3.594$, $p = .059$, indicating that if all other variables were ignored, the pattern of depressive symptoms scores for genders was similar. There was also a non-significant main effect of depressive symptoms, $F (1, 214) = 1.788$, $p = .183$, demonstrating that, if all other variables were ignored, scores on depressive symptoms were similar across time. The interaction between depressive symptoms and gender was non-significant, $F(1, 214) = 0.441$, $p = .507$, indicating that ratings for male and female adolescents were similar across time (cf. Table 2).

Finally, results for NSSI scores showed a non-significant main effect of gender, $F (1, 214) = 3.939$, $p = .048$. There was a non-significant main effect of NSSI, $F (1, 214) = 0.908$, $p = .342$, indicating that NSSI scores were similar across time. There was also a non-significant interaction effect between NSSI and gender, $F (1, 214) = 0.118$, $p = .732$, demonstrating that the pattern of NSSI scores for males and females was similar across time (cf. Table 2).

Correlations

Table 3 presents the correlations between all variables in study among the subsample of adolescents who reported a lifetime history of NSSI ($n = 216$). As can be seen in Table 3, all variables are concurrently associated in the expected direction. The longitudinal relationships among all variables under study were strong, suggesting the stability of the variables over time. The strength of the relationships amongst variables was analyzed according to Cohen's guidelines (1988).

Mediation analysis

This mediation analysis was conducted in the subsample of adolescents who reported a lifetime history of NSSI ($n = 216$). The proposed model was tested through a saturated or just-identified model (i.e., with zero degrees of freedom), which comprised 18 parameters. Only the direct effect of Depressive symptoms at Time 1 on NSSI at Time 2 was not statistically significant (b = -.13, SE = .069, Z = -1.926, *p* = .054, β = -.11) and for this reason it was removed, The model consisting of 17 parameters was respecified and recalculated (Figure 1). This respecified model revealed an adequate model fit: GFI = .99, CFI = 1.000, TLI = .95, RMSEA = .112, 90% C.I. = [0.000 to 0.243], *p* = .122. As can be seen in Figure 1, the final model accounted for 39% of Hated self at Time 2, 34% of Depressive symptoms at Time 2 and 60% of NSSI at Time 2 variances.

Results showed a significant indirect effect of NSSI at Time 1 on NSSI at Time 2, b = .11, 95% C.I. = [0.034 to 0.183], *p* = .008, through Hated self at Time 2 and Depressive symptoms at Time 2, even when the covariate depressive symptoms at Time 1 was controlled for. There was also a direct effect of NSSI at Time 1 on NSSI at Time

2, $\beta = .56$ (b = .54, SE = .051, Z = 10.565, $p < .001$), indicating that NSSI at Time 1

strongly predicted NSSI at Time 2 (cf. Figure 1).

Regarding the covariate variable, results demonstrated that depressive symptoms

at Time 1 had a significant indirect effect on NSSI at Time 2, b = .13, 95% C.I. = [0.073

to 0.199], $p = .001$, through Hated self at Time 2 and Depressive symptoms at Time 2.

Discussion

Although previous studies have identified concurrently and prospectively several

intra- and interpersonal factors associated with the engagement in NSSI, the underlying

intrapersonal factors for its maintenance remain unexplored. The current study aims to

concurrently compare intrapersonal variables between adolescents with and without a

lifetime history of NSSI; and to longitudinally test whether NSSI over lifetime history

predicts the occurrence of NSSI over the next six months through self-criticism (i.e.,

self-hatred) and depressive symptoms among adolescents with a self-reported history of

NSSI.

Cross-sectional analyses results largely replicated previous findings (e.g., Giletta

et al., 2012; Nock, & Prinstein, 2004; Xavier et al., 2016b) indicating that adolescents

who reported a lifetime history of NSSI tend to experience greater harsh and

persecutory criticism towards themselves and elevated depressive symptoms than

adolescents without a history of NSSI. Additionally, female adolescents tend to endorse

concurrently more NSSI than male adolescents. Our findings are consistent with the

literature, showing that females are more likely to report NSSI than males (e.g., Bresin

& Schoenleber, 2015). However, in the NSSI group, the pattern of NSSI over time is

similar for both males and females. In the literature there are mixed results, with some

longitudinal studies founding the same trend (e.g., Marshall et al., 2013) and other studies not (e.g., Guerry & Prinstein, 2009).

Results from the current study showed that the mean scores of hated-self remain similar across time and for both genders in NSSI group. On the one hand, this finding indicates that self-criticism is a stable characteristic in adolescence, as Shahar and colleagues (2004) have already demonstrated. On the other hand, this is a surprising result, given that across several studies girls tend to endorse more levels of self-criticism than boys (e.g., Xavier et al., 2016b, 2016c). When longitudinal associations are analyzed, it seems that the reciprocal effects between self-criticism and depression occur for females and not for males (Shahar et al., 2004).

Our finding that higher initial levels of NSSI predicted increased levels of subsequent NSSI is consistent with previous research (e.g., Guerry & Prinstein, 2009; Lundh et al., 2011; Marshall et al., 2013). In fact, a history of NSSI continues to be the strongest predictor of future NSSI, even in combination with other risk factors (e.g., emotional dysregulation, cluster b personality disorders, depression; for a review see Fox et al., 2015). The present results also extend this literature by demonstrating that the impact of past NSSI on subsequent NSSI occurs indirectly through the most severe form of self-criticism (i.e., hated self) and depressive symptoms. This finding seems to suggest that adolescents with a past history of NSSI who have a sense of hatred, disgust, and anger for the self, with the desire to persecute, punish, and exclude negative aspects of the self, tend to experience more depressive symptoms and feel defeated by their self-criticism, which in turn increases their levels of NSSI over time. NSSI may be used as a maladaptive strategy to cope with hostile and persecutory cognitions (i.e., self-criticism and self-attacking) and with threatening emotions to the self (e.g., disgust, depressive symptoms).

Although previous cross-sectional studies have found that adolescents with NSSI tend to be more self-critical (e.g., Glassman et al., 2007) and that self-hatred is strongly associated with NSSI (e.g., Xavier et al., 2016b), this study is the first to analyze the longitudinally associations between self-criticism, depressive symptoms, and NSSI. Our results also indicate the predictive ability of depressive symptoms to explain subsequent NSSI via self-hatred and depressive symptoms. This means that the impact of depressive symptoms at Time 1 on NSSI at Time 2 is carried by the effect of hated self, a punitive and harsh self-to-self relationship, and depressive symptoms at Time 2. This finding is in line with previous studies that found the reciprocal associations between depressive symptoms and NSSI among adolescents (Lundh et al. 2011; Marshall et al., 2013; Prinstein et al., 2010). It also adds to the current knowledge the role of self-criticism in the complex interplay between negative emotional states and NSSI. It seems that the depressive symptoms of adolescents with NSSI are congruent with their negative self-view (e.g., as unlovable, weak, bad). When adolescents fail to defend against their one self-attacks, they may experience depressive symptoms, states of defeat, and consequently engage in NSSI. At some extent, these findings are in accordance with the biopsychosocial approach of shame and self-attacking, where the hostile self-to-self relationship and related defeat states are linked to several psychological problems (Castilho et al., 2013; Gilbert, 2000; Gilbert & Irons, 2005; Gilbert & Procter, 2006; Gilbert et al., 2004).

Furthermore, these results confirm the theoretical models for NSSI (e.g., Chapman et al., 2006; Klonsky, 2009; Nock, 2009), suggesting that adolescents with a history of NSSI engage in future NSSI as a way to cope with negative emotional states (e.g., depressive symptoms, disgust, shame, anger) and to punish the self. This self-to-self persecutory and hatred relationship reinforce the negative emotional states that are

further reduced by the engagement in NSSI. It seems that the pernicious blend between a sense of hatred and anger with the self, the desire to exclude and punish the self, and related depressive symptoms seem to negatively reinforce and maintain NSSI. To sum up, the tested theoretical model reflects the vicious cycle between the activation of negative emotional states and self-punishment, as well as highlights that intrapersonal factors are nuclear aspects to understand the maintenance of NSSI.

Some strengths and limitations of this study should be acknowledged. This study has a longitudinal design that allows us to analyze the temporal relationships between variables. Moreover, the current study focuses on intrapersonal factors theoretically implicated in the maintenance of NSSI and tests its maintenance cycle in a sample of adolescents with a history of NSSI. However, the current study has some methodological limitations. First, the study design has only two waves. Future studies might involve more waves of assessment with different follow-up periods to assess which factors remain over time in the maintenance of NSSI. Secondly, although this study used adolescents with a history of NSSI, they are from the community, and therefore, results cannot be generalized to clinical populations. Third, NSSI was measured using a self-report questionnaire. Although self-report questionnaires are valid and benefit from being anonymous, clinical interviews provide a more reliable gold-standard approach to assess NSSI (e.g., frequency, functions, and methods). Thus, future studies should include multi-method assessment tools, including self-report questionnaires in conjunction with semi-structures interviews and ecological momentary assessment (EMA; e.g., Nock, Prinstein, & Sterba, 2009). Additionally, future studies would benefit from adopting a common assessment based on the diagnose criteria proposed for NSSI disorder in the DSM-5. Finally and importantly, we recognize that other variables may account for the maintenance of NSSI that we did not

analyze in the current study (e.g., rumination, impulsivity, and other maladaptive emotion regulation strategies). However, we believe that our findings, while not covering the multi-determined nature of NSSI entirely, shed light on the complexity of the processes involved in it.

The current study has some clinical implications. The therapeutic work should evaluate the origins and functions of self-criticism. In addition, therapy with individuals who self-injure should address the hostile and harmful intent of internal self-criticizing/attacking, and the associated feelings of shame, anger, and hatred. Therapeutic approaches that promote the development of inner warmth and compassion for the self as a counter affective response to self-disgust, self-hatred, and self-critical views (such as, Compassion Focused Therapy; Gilbert, 2010) may be useful for those individuals.

Compliance with Ethical Standards:

Conflict of Interest: Author A.X., Author J.P.G., Author M.C., and Author A.D. declare that they have no conflict of interest.

Access to Data: Author A.X., Author J.P.G., Author M.C., and Author A.D. take responsibility for the integrity of the data and the accuracy of the data analysis.

Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Human participants and their legal representatives gave

informed consent to participate in this study. This article does not contain any studies with animals performed by any of the authors.

Informed consent: Informed consent was obtained from all individual participants included in the study.

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Table 1

Descriptive statistics and differences between Non-NSSI and NSSI groups at baseline

(Time 1; N = 418)

	Non-NSSI (*n* = 202)	NSSI (*n* = 216)	Statistical test	*p*	Effect size
	M (SD)	*M (SD)*			
Demographics					
Age	14.81 (1.53)	15.03 (1.41)	t(416) = 1.540	.124	n/a
Years of education	9.40 (1.42)	9.56 (1.39)	t(416) = 1.160	.247	n/a
Gender: % female (n)	49.5% (100)	65.3% (141)	X²(1) = 10.637	.001	Phi = .160
Variables					
T1 Hated self	1.71 (2.50)	5.31 (4.44)	t(343.485) = 10.281	<.001	d = 0.99, r = 0.45
T1 Depressive symptoms	2.86 (3.67)	6.72 (5.22)	t(386.608) = 8.799	<.001	d = 0.86, r = 0.39
T1 Lifetime NSSI	0.62 (1.63)	5.57 (6.72)	t(241.933) = 10.496	<.001	d = 1.01, r = 0.45

Note. T1 = variable measured at baseline assessment; T2 = variable measured after 6-month period; NSSI = Non-suicidal self-injury measured by the Risk-taking and Self-harm Inventory for Adolescents (RTSHIA).

Table 2

Means and standard deviations of main study variables for total sample of NSSI group and for gender (N = 216)

	Total (*N* = 216)		Males (*n* = 75)		Females (*n* = 141)	
Variables	*M*	*SD*	*M*	*SD*	*M*	*SD*
T1 Hated self	5.31	4.44	4.52	4.04	5.73	4.60
T2 Hated self	4.80	4.38	4.23	3.67	5.11	4.69
T1 Depressive symptoms	6.72	5.22	5.79	4.86	7.22	5.35
T2 Depressive symptoms	6.20	4.92	5.56	4.49	6.55	5.11
T1 NSSI	5.57	6.72	4.52	6.53	6.13	6.78
T2 NSSI	5.94	6.48	4.73	5.36	6.58	6.94

Note. T1 = variable measured at baseline assessment; T2 = variable measured after 6-month period; NSSI = Non-suicidal self-injury measured by the Risk-taking and Self-harm Inventory for Adolescents (RTSHIA).

Table 3

Correlations product-moment Pearson between all variables in study for NSSI group

(N = 216)

	T1			T2	
Variables	**Hated self**	**Depressive symptoms**	**NSSI**	**Hated self**	**Depressive symptoms**
T1					
Hated self	-				
Depressive symptoms	.64	-			
NSSI	.62	.47	-		
T2					
Hated self	.66	.49	.58	-	
Depressive symptoms	.48	.57	.37	.67	-
NSSI	.46	.38	.73	.62	.49

Note. All correlation coefficients are statistically significant at $p < .001$. T1 = variable measured at baseline assessment; T2 = variable measured after 6-month period; NSSI = Non-suicidal self-injury measured by the Risk-taking and Self-harm Inventory for Adolescents (RTSHIA).
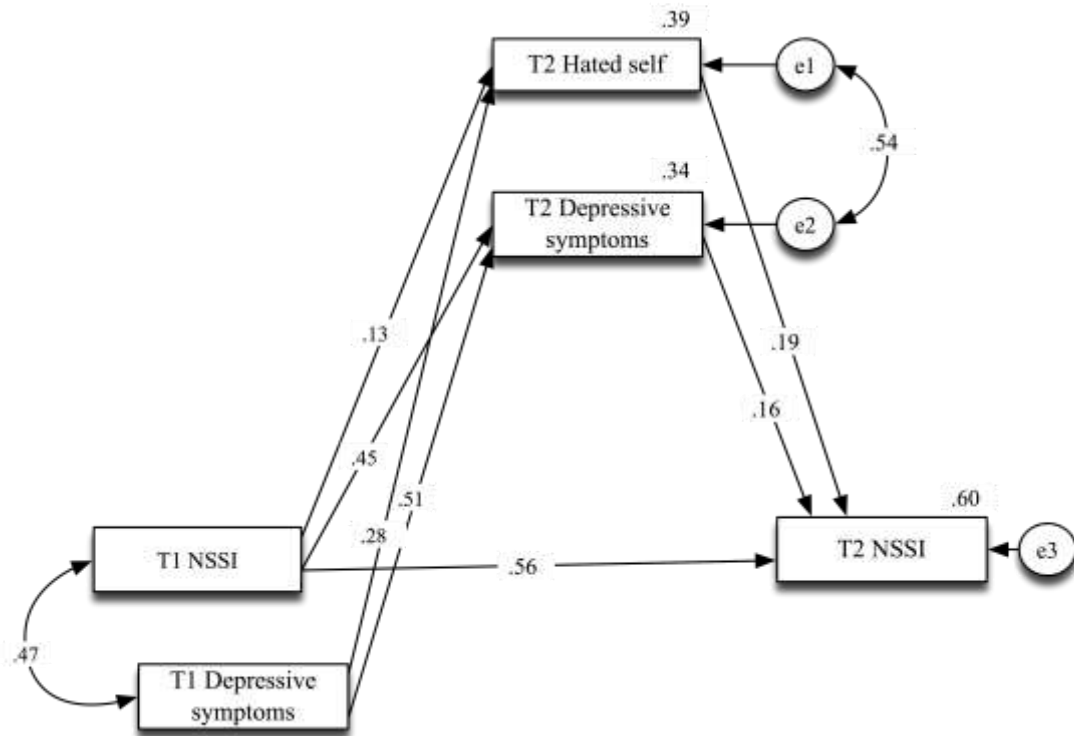
Figure 1. Path analysis predicting the impact of Lifetime Non-suicidal self-injury

(NSSI) at Time 1 on NSSI at Time 2 through Hated self at Time 2 and Depressive

symptoms at Time 2 ($N = 216$). Depressive symptoms at Time 1 is the covariate

variable. Standardized regression coefficients and squared multiple correlations are

presented; all paths are statistically significant ($p < .001$).