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Posted Date: 24 December 2024

doi: 10.20944/preprints202412.2070.v1

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 doi:10.20944/preprints202412.2070.v1

Article

Self-Regulation, Emotional Symptomatology, Substance Use, and Social Network Addiction in Adolescent Self-Harm

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Abstract: Background: Non-suicidal self-injurious behavior (NSSI) is a phenomenon of growing concern in the field of mental health during adolescence. **Methods:** In a sample of 354 adolescents (51.7% boys) with a mean age of 15.01 years (range between 12 and 20 years), the relationships of NSSI with self-regulation strategies, substance use, dependence on social networks, and symptomatology were analyzed. **Results:** The results showed that adolescents who engage in NSSI use fewer adaptive strategies of emotional self-regulation (self-control) and make greater use of strategies such as self-blame and rumination than those who do not engage in NSSI. They also show more psychological symptomatology, more dependence on social networks, and more substance use. Gender is an important factor, with more girls (62.8%) than boys (37.2%) self-harming. Regression analyses showed that self-harm was associated with more symptomatology and more substance use for both boys and girls. For girls, it was also associated with maladaptive self-regulation strategies. The variables analyzed allow us to correctly classify 89.5% of the boys who do not self-harm and 72.8% of the girls who do. **Conclusion:** This study provides insight into the relationships among self-regulation, digital addiction, substance use, emotional symptomatology, and NSSI in adolescents, highlighting the importance of gender.

Keywords: Non-suicidal self-injury (NSSI); Self-regulation; Social network addiction; Substance use; Adolescents; Gender.

The presence of NSSI is particularly relevant during adolescence, given that this stage is a critical period for emotional and behavioural development, where biopsychosocial changes not only amplify individual vulnerabilities, but also generate an environment conducive to the emergence of maladaptive behaviours such as NSSI [6]. Several studies have reported an increase in the incidence of these behaviours among adolescents, finding prevalences ranging from 4% to 45%, with a higher frequency in girls than in boys and in clinical samples compared to samples from the general population [3,6,11,12]. Similarly, in the Spanish population of adolescents and young adults, prevalences ranging from 10.3% to figures covering up to half of the samples studied have been reported [13,14]. Together with the adolescent period, gender emerges as another relevant risk factor. Being female, especially in the 15-25 age range, is significantly associated with factors such as biographical stress and family conflicts, which in turn are linked to NSSI [2,15–17]. This suggests the importance of studying this phenomenon in the adolescent population and especially among girls, highlighting not only the seriousness of the phenomenon, but also the importance of identifying the most relevant variables associated with NSSIs among adolescent girls. This will be of great importance in order to implement prevention and early detection strategies adapted to the specific needs of this age group.

 doi:10.20944/preprints202412.2070.v1

Non-suicidal self-injurious behaviour (NSSI) is a multifactorial phenomenon of remarkable complexity [9], associated with the presence and confluence of various risk factors. These include emotional conditions such as depression and anxiety [18–20], adolescents' own self-regulation [21–23], risk behaviours associated with substance use [3,24,25] and contextual factors associated with problematic internet and social network use [5,26]. Although the significant association of these variables with NSSI has already been evidenced, the joint analysis of these variables on self-injurious behaviours requires further studies to explore the differential and relative contribution of each of them, as well as their confluence. For example, maladaptive regulation strategies such as self-blame or rumination tend to perpetuate emotional distress in adolescents [18,27,28] facilitating the presence of NSSI in an attempt to alleviate or avoid negative emotions, express suffering or distress, or seek a sense of control in the face of inner emptiness. The absence of adequate tools to manage emotions contributes significantly to the onset and maintenance of NSSI [15,29–33].

Emotional distress has also been shown to be a facilitator of substance use [34,35] or problematic use of the Internet or social networks [36–38], which in turn is associated with NSSI [26,39]. Similarly, excessive internet and social networks consumption has been linked to both emotional distress in adolescents [37,40,41] and to the practice of NSSI [5,42]. This evidence shows the importance of the joint analysis of these variables.

In accordance with the previously mentioned background, the general aim of the present study was to analyse the relationships between non-suicidal self-injurious behaviours (NSSI) and the variables of self-regulation, emotional problems, substance use, and social network addiction. More specifically, the following objectives were established: (1) To analyze adolescents with and without NSSI in terms of these variables, examining the associations between each variable and NSSI; (2) To explore how these factors may explain the severity of NSSI and develop a model to account for the occurrence of NSSI; (3) To determine whether this set of factors can predict and classify adolescents with versus without NSSI, while assessing the specific predictive contribution of each factor; (4) Finally, to examine the role of sex in the relationships between these variables and NSSI.

According to the literature reviewed and the objectives, we expect to find significant associations between non-suicidal self-injurious behaviour (NSSI) and a set of key variables: emotional symptomatology, emotional self-regulation strategies, social network addiction and substance use. In specific terms, it is anticipated that maladaptive self-regulatory strategies, together with high levels of anxiety, depression and withdrawal, will be the most prominent predictors of NSSI. Self-harm, as repeated studies have shown, is associated with the presence of emotional distress and inadequate coping, with maladaptive regulatory strategies being an inadequate coping mechanism which in turn contributes to increasing this distress and thus increasing the presence of NSSI in a kind of vicious cycle. In relation to the gender is expected to be a significant factor in these relationships. Girls will have a significantly higher prevalence of NSSI compared to boys, as well as a higher vulnerability to maladaptive self-regulation strategies and dependence on social networks [3,5,6,36,39,40]. Finally, it is expected that the variables analysed will allow for a significant differentiation between adolescents with and without NSSI. The relative weight of each factor will provide information to establish more robust predictive models, which will contribute to the development of prevention and intervention strategies adapted to individual and contextual characteristics.

1.Method

Participants

The study sample consisted of 354 participants, with an age range between 12 and 20 years (M = 15.01 years, SD = 1.91). Of the participants, 51.7% were male (n = 183) and 48.3% were female (n = 171). In terms of place of origin, 83.9% were from Spain (n = 297) and 14.4% from outside Spain (n = 51). There were 6 missing cases in this category.

Regarding the origin of the parents, 74.6% of fathers (n = 264) and 77.4% of mothers (n = 274) were of Spanish nationality. Among parents born outside Spain, various nationalities were observed,

 doi:10.20944/preprints202412.2070.v1

including Venezuela (2.5%), Ecuador (3.1%) and Morocco (2.0%) among fathers, and Ecuador (3.1%), Venezuela (3.1%) and Morocco (2.0%) among mothers.

Within the sample, 70.3% of participants lived with both parents, 11.3% lived with one parent, 7.6% lived in shared custody, and 6.8% lived in households with one parent and their current partner.

We found that 94.6% of the sampled young people reported having their own mobile phone. Of this group, 92.1% had an internet connection. Regarding the time dedicated to accessing social media and browsing the internet, 26.6% of the sample spent two hours online daily, whereas 41.5% exceeded three hours of online activity.

Instruments and measures

The following section details the instruments used to measure the variables assessed in the present study: self-injury, drug and social media addiction, self-regulation, symptomatology, and sociodemographic variables.

Self-injury measures. *The Self-Report Scale Functional Assessment of Self-Mutilation* [43,44] was used to evaluate the occurrence and frequency of different types of self-injurious behaviors. These behaviors include cutting or scratching the skin, hitting oneself, pulling out hair, picking at wounds, inserting objects under the skin, biting oneself, and rubbing or scratching the skin to the point of bleeding. In this study, tattooing was excluded as a form of self-injury, and the item related to tattoos was omitted when calculating the total self-injury score. The scale captures the methods, frequency, and functions of self-injury over the 12 months prior to the assessment. In the current sample, the scale demonstrated acceptable internal consistency by Cronbach's alpha (11 items, α = .75). For analytical purposes, self-injury was considered both as a categorical variable (presence of at least one self-injurious behaviour vs. absence of self-injury) and as a continuous variable based on the total score and indicating the intensity of NSSI.

Social media and drug addiction were assessed using two measures: (1) the Symptoms of Addiction scale, which evaluates addiction to online technologies (e.g., "I would be angry if I had to do without social networks"). This scale consists of 9 items (α = .73) and is derived from the *Scale of Risk of Addiction to Social Networks and Internet for Adolescents* [45]. The ERAR-SI comprises 29 items distributed across four dimensions: symptoms of addiction, social media use, "freaky" traits, and nomophobia. Responses are recorded on a 4-point frequency scale ranging from 1 (never or almost never) to 4 (almost always or always). (2) A single-item question specifically developed for this study: "Have you ever taken any drugs other than alcohol?" Responses were measured on a 4-point Likert scale: 1 ("never"), 2 ("in isolation"), 3 ("from time to time"), and 4 ("often").

Self-regulation measures. Three measures were used to assess the self-regulation: 1) the *total score of adaptive regulation* (13 items, α = .68) from *The Brief Self-Control Scale* [46]. It is a 13 item broad used measure to assess self-control including three dimensions: Non-reflective control of impulses, Self-discipline and Reflective control of impulses with a *5-point Lickert scale from 1 "not at all" to 5 "very much" indicating how much a person typically is on each item (e.g.., "*I am good at resisting temptation*");* 2) The *self-blame scale* (4 items, α = .67; i.e., thinking that one is responsible for what happened) and 3) The *rumination Scale* (4 items, α = .76; i.e., reflecting on the feelings and thoughts associated with what happened). These scales are part of the *Cognitive Emotion Regulation Questionnaire, CERQ-S* [47]. It is a 36-item questionnaire that measures the cognitive emotional regulation strategies a person uses in response to a stressful life event (i.e., Self-blame, Acceptance, Rumination, Positive refocusing, Refocus on planning, Positive reappraisal, Putting into perspective, Catastrophizing, and Other-blame). On the items, measured using a Likert-type scale (from 1 = *almost never* to 5 = *almost always*), the higher the score, the greater the use of the coping strategy in question. Self-blame and rumination subscales have been referred to as less *adaptive strategies.*

Psychopathological Symptoms. The internalizing broad dimension of the *Youth Self Report YSR* [48] was used (21 items, α = .87) including the anxiety, depression and withdrawal symptoms. YSR is a self-report questionnaire that evaluates emotional and behavioral problems in children and

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adolescents. It has 112 items measured on 3 Likert-type scale response options (0 = not true to 3 = true, very often, or fairly often).

Socio-demographic data and additional information. A sheet of sociodemographic information and complementary information was developed ad hoc for this study. It included information about sex (boy versus girl), age, place of birth, and with whom they usually lived. In addition to that, participants included information about their possession of a mobile phone and their access to the internet, as well as their use of social networks and the time they spent on these platforms.

Procedure

Data collection was carried out by two trained PhD researchers using a questionnaire that participants completed individually in their regular classrooms. The questionnaire was administered in a single session lasting approximately one hour, ensuring that all participants received uniform instructions on how to proceed.

The boards of the participating secondary schools and the ethics committee of the university approved the study, which was conducted in accordance with the ethical principles set out in the Declaration of Helsinki.

To ensure compliance with ethical standards, informed consent was obtained from parents or legal guardians in the case of participants under 16 years of age, and from the students themselves for those over 16 years of age. Participants were informed that their responses would be treated anonymously and confidentially, and that the results obtained would be used exclusively for research purposes. The questionnaires were administered by the researchers, who were supported by the teachers present in the classrooms throughout the process.

Data Analysis

The study was quantitative and cross-sectional. Correlation and MANOVA analyses Sex (boys and girls) by NSSI (yes and no) on addiction (social networks and substance abuse), self-regulation (self-control, self-blame and rumination), and psychological symptomatology were calculated to understand the differences between boys and girls, and between adolescents with and without non-suicidal self-injurious behaviors on these variables. To provide a more comprehensive understanding of the relationships between variables, two types of regression analyses were conducted: multiple regression, using NSSI as a continuous variable, and logistic regression, using NSSI as a categorical variable. Multiple regression was employed to explore how predictors or factors explain the severity of NSSI and to assess the specific contribution of each predictor to the model. Logistic regression, on the other hand, examined whether the set of factors could predict and influence the presence or absence of NSSI. The variables used as predictors were sex, addictions (social networks and substance use), adaptive (self-control) and maladaptive (self-blame + rumination) strategies of self-regulation, and psychological symptomatology. Finally, we performed logistic regression analyses to assess the impact of sex, addictions, strategies of self-regulation, and psychological symptomatology on the likelihood that adolescents would engage in self-injury.

Results

Basic Descriptive Statistics and Differences between Sex (boys and girls) and Self-Injury (yes/no) on Addictions (Social Networks and Substance use), Self-regulation and Psychological Symptomatology

Preliminary sample data indicate that the prevalence of NSSI was higher among girls (62.8%) than boys (37.9%) [X^2 (1, N = 354) = 21.51, p < .001; Cramer's V = .247]. More than half of those who self-harm (52.7%) logs on to social networking sites for 3 or more hours per day. This percentage drops to one-third (33.5%) among those who do not self-injure [X^2 (2, N = 354) = 14.51, p = .001; Cramer's V = .202]. On the other hand, among those who self-injured, 61.5% had high social network

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dependence (score above the median), compared to 64.6% who had low dependence (score below the median) and did not self-injure [X^2 (1, N = 354) = 23.50, p < .001; Cramer's V = .258].

Table 1 shows the Pearson correlations between the variables analyzed. All of them are statistically significant, highlighting their relationship with NSSI (from r = .24 to r = .30) and psychological symptomatology (from r = .16 to r = .43). The association between NSSI and symptomatology shared 29% of variance (p < .001). Also noteworthy is the correlation between the two maladaptive self-regulatory strategies, self-blame and rumination (r = .63; p < .001).

Table 1. Correlation Analysis (N = 354).

	1	**2**	**3**	**4**	**5**	**6**	**7**
1.Addiction to social networks	1						
2. Substance use	.16**	1					
3. Self-control	-.38***	−.18**	1				
4. Self-blame	.21***	.11*	-.16**	1			
5. Rumination	.26***	.14**	-.15**	.63***	1		
6. Symptomatology	.33***	.16**	-.37***	.43***	.35***	1	
7. NSSI (Self-injury)	.30***	.25***	-.30***	.27***	.24***	.54***	1
Mean	17.67	1.35	42.27	10.15	11.59	11.42	1.26
SD	4.74	.75	7.84	3.53	4.09	7.55	1.83

*p < .05; **p < .01; *** p < .001.

The means and standard deviations by sex (boys and girls) and NSSI for addiction to social networks and the internet, substance use, self-regulation and psychological symptomatology are shown in table 2. Firstly, two multivariate analyses of variance (MANOVA) were conducted to analyze: one the effects of NSSI and sex on the addictive behaviors, and another the effects of NSSI and sex on self-regulation strategies.

The first MANOVA analysis found significant effects of NSSI (Wilks' Λ = 0.94, F = 11.63, p < .001, $p\eta^2$ = .064) and sex (Wilks' Λ = 0.97, F = 5.93, p = .003, $p\eta 2$ = .034) on addictions. Tests of the between-subjects effect found a significant effect of NSSI on addiction to social networks (p < .001) and substance use (p = .011); and a significant effect of sex on addiction to social networks (p = .001). Girls scored significantly higher for addiction to social networks; however, boys and girls scored the same for substance use. Adolescents who self-injured scored higher on both addiction-related behaviors: social networking and substance use. The effect size (Cohen's d) in both independent variables (sex and NSSI -yes/no-) was small for substance use and medium for addiction to social networks (see table 2).

The second MANOVA analysis found significant effects of NSSI (Wilks' Λ = 0.92, F = 10.33, p < .001, $p\eta^2$ = .082) and sex (Wilks' Λ = 0.97, F = 4.22, p = .006, $p\eta 2$ = .035) on self-regulation strategies. Tests of the between-subjects effect found a significant effect of NSSI on the three strategies considered: self-control (p < .001), self-blame (p = .002), and rumination (p = .018); and a significant effect of sex (p = .001) on rumination. Girls scored significantly higher for rumination; however, boys and girls scored the same for self-control and self-blame. Adolescents who self-injured scored lower on self-control and higher on rumination and self-blame self-regulatory strategies than those who did not self-injure. The effect size (Cohen's d) comparing boys and girls was small for self-control and self-blame, and medium for rumination. The effect size (Cohen's d) comparing NSSI (yes/no) was small for self-blame and rumination, and medium for self-control.

No significant interactions between sex and NSSI were found in any of the previous analyses (all with $p \geq .05$).

On the other hand, an ANOVA analyzing the relationships between NSSI and sex on psychological symptomatology revealed that adolescents who self-injured reported more symptoms than those who did not self-injure (p < .001); and girls reported more symptoms than boys (p = .001). The effect size (Cohen's d) of the differences in symptomatology was medium for boys' and girls'

 doi:10.20944/preprints202412.2070.v1

comparison, and large for NSSI (yes/no) comparison. No significant interaction between sex and NSSI was found ($p \geq .05$).

Finally, the total score for the number of self-injuries was significantly higher for girls (*mean* = 1.74, *SD* = 2.09) than for boys (*mean* = .81, *SD* = 1.40), with a medium effect size [F (1, 353) = 24.06, $p < .001$; $d = .52$].

Table 2. Effects by sex (boys = 183; girls = 171) and Self-Injury (NSSI = 145; No-NSSI = 201).

	Boys	**Girls**	***F***	***p***	***d***
	Mean (*SD*)	Mean (*SD*)			
Addiction to social networks	16.56 (4.70)	18.82 (4.52)	11.39	.001	.49
Substance use	1.34 (.75)	1.37 (.77)	.06	.805	.04
Self-control	43.08 (7.44)	41.40 (8.17)	.51	.474	.22
Self-blame	9.80 (3.56)	10.53 (3.48)	2.00	.158	.21
Rumination	10.80 (4.18)	12.44 (3.83)	11.78	.001	.41
Symptomatology	9.52 (6.73)	13.44 (7.86)	11.89	.001	.54
	NSSI	No -NSSI	*F*	*p*	*d*
	Mean (*SD*)	Mean (*SD*)			
Addiction to social networks	19.21 (4.69)	16.55 (4.47)	19.40	<.001	.58
Substance use	1.48 (.85)	1.26 (.67)	6.57	.011	.29
Self-control	39.76 (7.39)	44.07 (7.67)	24.35	<.001	.57
Self-blame	10.93 (3.75)	9.59 (3.27)	9.75	.002	.38
Rumination	12.43 (4.20)	11.00 (3.91)	5.61	.018	.35
Symptomatology	15.28 (7.75)	8.64 (6.04)	64.19	<.001	.96

Note: *d* = Cohen's effect size. Modeling and predicting Non-Suicidal Self-Injurious behavior (NSSI) from Addictions (Social Networks and Substance use), Self-regulation and Psychological Symptomatology.

Given the high correlation between self-blame and rumination strategies (r = .63), a single variable (sum of both subscales) was created to capture the joint score of maladaptive self-regulation strategies (*mean* = 21.74, *SD* = 6.89, α = .82, 8 items).

The variables used as predictors were sex, addictions (addiction to social networks and substance use), adaptive (self-control) and maladaptive (self-blame + rumination) strategies of self-regulation, and psychological symptomatology (score that includes anxiety, depression and withdrawal).

For the multiple regression analysis, the regression model for the total sample was statistically significant [F (6,345) = 29.15, $p < .001$]. The multiple correlation coefficient (R), using all the predictors simultaneously, was .58 (R^2 = .34) and the adjusted R^2 was .33, meaning that 33% of the variance in self-injury can be predicted from the independent variables considered. Significant predictors were sex (more presence of NSSI in girls), symptomatology and substance abuse. The regression models were also significant for boys [F (5,176) = 12.19, $p < .001$] and girls [F (5,168) = 19.43, $p < .001$] analyzed separately, explaining 24% and 35%, respectively, of the NSSI. The maladaptive strategy of self-regulation analyzed (self-blame + rumination) was also a significant predictor of NSSI for girls (see table 3).

Table 3. Multiple Regression Analyses Summary predicting Self-injury score in the total sample, and in boys and girls separately.

	Total sample (*N* = 354)			**Boys (*N* = 183)**			Girls (*N* = 171)		
Variable	***B***	***SEB***	***β***	***B***	***SEB***	*β*	*B*	*SEB*	*β*
Sex	.40	.17	.11*						
Addiction to social networks	.03	.02	.08	.02	.02	.06	.03	.03	.07

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Substance use	.36	.11	.15**	.32	.13	.17*	.49	.17	.18**
Self-control	-.02	.01	-.07	-.02	.02	-.11	-.02	.02	-.06
Self-blame+ Rumination	.01	.01	-04	-.03	.02	-.15	.07	.02	.20**
Symptomatology	.10	.01	.42***	.09	.02	.42***	.11	.02	.40***
Constant	-1.03	.75		.72	.89		-1.83	1.16	

Note: Sex: 1 = boys, 2 = girls; *$p < .05$; **$p < .01$; *** $p < .001$.

Finally, we performed logistic regression analyses to assess the impact of sex, addictions (social networks and substance use), strategies of self-regulation (adaptive - self-control- and maladaptive - self-blame + rumination-), and psychological symptomatology on the likelihood that adolescents would engage in NSSI behaviors. Additionally, the potential capacity of classification of these predictors on NSSI. The logistic regression model was statistically significant for total sample [$\chi 2$ (6, $N = 346$) = 87.65, $p = .0001$], boys [$\chi 2$ (5, $N = 177$) = 29.59, $p = .0001$], and girls [$\chi 2$ (5, $N = 169$) = 46.40, $p = .0001$]. The models explained (Nagelkerke R^2) 30%, 22%, and 32% of the variance in NSSI, for total sample, boys, and girls, respectively. The models correctly classified 69.7% (79.6% no-self-injury, 55.9% self-injury) of cases for total sample; 72.3% (89.5% no-self-injury, 32.1% self-injury) of cases for boys, and 68% (62.3% no-self-injury, 72.8% self-injury) of cases for girls. Table 4 presents coefficients and logistic regression statistics.

Table 4. Logistic Regression Analyses Predicting Self-Injury (yes - no) by Sex, Addictions (Social networks and Substance use), Self-regulation (Adaptive – Self-control- and Maladaptive –Self-blame + Rumination -), and Psychological Symptomatology.

Predictors	*B*	*SE*	Wald	Exp. (*B*)	95% *CI* (lower, upper)
Total sample					
Sex	.64	.26	6.24*	1.90	1.15, 3.13
Addiction so social networks	.05	.03	3.30	1.06	.99, 1.12
Substance use	.18	.17	1.14	1.19	.86, 1.65
Self-control	-.03	.02	2.47	.97	.94, 1.01
Sel-blame + Rumination	-.00	.02	.01	.99	.96, 1.04
Symptomatology	.11	.02	26.80**	1.12	1.07, 1.16
Constant	-2.54	1.14	4.97	.08	
Boys					
Addiction so social networks	.05	.04	1.33	1.05	.97, 1.13
Substance use	.15	.24	.39	1.16	.73, 1.84
Self-control	-.04	.03	2.06	.96	.91, 1.02
Sel-blame + Rumination	-.06	.03	3.56	.95	.90, 1.00
Symptomatology	.11	.03	12.57**	1.12	1.05, 1.19
Constant	-.16	1.69	.01	.85	
Girls					
Addiction so social networks	.04	.05	.97	1.05	.96, 1.14
Substance use	.35	.26	1.84	1.42	.86, 2.35
Self-control	-.03	.03	1.03	.98	.93, 1.02
Sel-blame + Rumination	.07	.03	4.41*	1.07	1.00, 1.14
Symptomatology	.11	.03	14.18**	1.12	1.05, 1.18
Constant	-2.97	1.62	3.37	.05	

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

Two factors were significant predictors of presence/absence of self-injury in the total sampled analyzed: sex and psychological symptomatology. The use of maladaptive self-regulation strategies

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(self-blame + rumination) was also a significant predictor of self-injury among girls. Addictions (to social network and substance use) and the use of adaptive self-regulation strategy (self-control) were not significantly associated with presence/absence of self-injury among the sampled adolescents.

The *ORs* indicate that the probability of presenting self-injury increased 1.12 times for each point increase on the psychological symptomatology. Likewise, being a girl increased the probability of self-injury 1.90 times, and using maladaptive self-regulation strategies (self-blame + rumination) increased the probability of self-injury 1.07 times in girls.

Discussion

The high prevalence of self-injurious behaviors (NSSI) among adolescents [13, 21, 22, 32, 34, 39, 51] has become a growing concern in the field of mental health. Gaining a deeper understanding of the factors associated with this phenomenon remains one of the key challenges in contemporary research, necessitating further studies and robust empirical evidence. The primary aim of this study was to examine the relationships between NSSI and a set of variables, including addictions (e.g., social network use and substance use), self-regulation (adaptive, such as self-control, and maladaptive, such as self-blame and rumination), and psychological symptomatology. As we expected the findings reveal significant associations between NSSI and maladaptive self-regulation strategies (self-blame and rumination), elevated levels of anxiety, depression and withdrawal symptoms, and greater dependence on social networks and psychoactive substances. Furthermore, these relationships exhibited some significant differences between boys and girls that should be taken into account.[13,21,22,32,34,39,51

According to the first objective (differences between adolescents with and without NSSI), in terms of addictive behaviours, boys and girls who self-harmed showed a greater addiction to social networks and substance use. This finding is in line with studies such as Ospina et al. [21] and Troya-Fernández et al. [41], who identify these behaviours as maladaptive strategies of emotional regulation. Similarly, Jeréz-Cañabate et al. [35] highlight that both NSSI and substance use serve as emotional relief mechanisms, particularly in adolescents experiencing high levels of distress. However, Sánchez-Sánchez [22] notes that these associations may vary across cultural and social contexts, indicating that they are not universally observed. Overall, this evidence is consistent with the literature emphasising the strong connection between emotional dysregulation, NSSI and addictive behaviours.

Differences in self-regulation strategies were also found, with boys and girls with NSSI showing less self-control and using more self-regulatory strategies of rumination and self-blame than adolescents who do not self-harm. This finding is in line with the work of Bautista et al. [23], who highlighted the link between emotional dysregulation, low self-control and maladaptive coping mechanisms in adolescents with NSSI. Similarly, Sánchez-Sánchez [22] highlighted that self-blame and rumination are common among adolescents with emotional distress. However, some studies, such as Jeréz-Cañabate et al. [35], suggest that not all adolescents with NSSI present significant differences in self-regulation when controlling for psychiatric comorbidities, indicating variability across populations. Overall, this evidence supports the association between poor self-regulation and NSSI, in line with the literature's emphasis on emotional vulnerability and maladaptive strategies.

Adolescents who engage in self-harm show a greater presence of psychological symptoms compared to those who do not engage in self-injurious behaviour. This finding is consistent with previous research, such as that of Carrasco et al. [13], which highlights the relationship between self-injurious behaviours, both suicidal and non-suicidal, and various mental health problems, including depression and anxiety. Similarly, Carretero et al. [39] highlight how emotional vulnerability and impulsivity contribute to a higher prevalence of symptoms among adolescents who self-harm. Other studies, such as those by Sánchez Alonso [31], point out that the variability of symptomatology depends on diagnostic criteria, contextual factors and the presence of comorbidities. Overall, this evidence is consistent with the existing literature highlighting a strong link between NSSIs and increased psychological distress, reinforcing the importance of early intervention and comprehensive assessments.

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The effect sizes of these differences ranged from small to medium, with the exception of large effect size differences observed for symptomatology in the comparison between adolescents with and without NSSI.

In order to explore how these factors may explain the severity of NSSI (objective 2) three significant variables were found: sex (more presence of NSSI in girls), symptomatology and substance abuse. These three factors together can predict up to 33% of the variance in self-injury. Symptomatology (i.e. depression, anxiety and withdrawal) was the most important predictor compared to sex and substance abuse.

Complementary to the previous findings, the factors studied showed significant ability to predict and classify adolescents with/without NSSI (aim 3). In line with the multiple regression analyses, logistic regression showed that two factors were significant predictors of presence/absence of self-harm in the total sample analyzed: gender and psychological symptomatology. However, substance abuse was not significant in differentiating adolescents with and without NSSI. ORs indicate that the probability of self-harm increased 1.12 times for each point increase in psychological symptomatology, and those variables correctly classified 69.7% (79.6% no-self-injury, 55.9% self-injury) of cases for total sample.

These findings reaffirm psychological symptomatology - specifically depression, anxiety and withdrawal - as the most significant predictor of NSSI severity, consistent with previous studies [8, 10]. Symptomatology explains a significant proportion of the variance in self-harm, underscoring its central role in understanding these behaviours. In contrast, substance abuse, although contributing to the severity of NSSIs in multiple regression, did not differentiate between adolescents with and without NSSIs in logistic regression. This suggests that substance use may intensify self-injurious behaviors but lacks the specificity to serve as a unique or main predictor, as highlighted by Obando et al. [25], compared to other variables such as impulsivity [39].

The results show that maladaptive self-regulation strategies, such as self-blame and rumination, are more significant predictors of non-suicidal self-injurious behaviour (NSSI) compared to adaptive strategies. These patterns, especially predominant in women, not only increase emotional distress, but also perpetuate and reinforce the occurrence of NSSI, in line with Sanchez-Sanchez [22]. Logistic regression highlights the importance of [8,10symptomatology and gender in the classification of adolescents, with models correctly identifying almost 70% of cases. Notably, maladaptive strategies were only predictive for females, aligning with studies reporting higher emotional vulnerability and prevalence of NSSI among girls [39].

The finding that substance use is not a significant differentiating factor between adolescents with and without self-harm, although it does contribute to explaining the severity of NSSIs in multiple regression models, could be related to the widespread prevalence of substance use in this population. Research such as Obando et al. [25] and Ramírez Gamboa and Restrepo Soto [19] have pointed out that substance use is a common practice among adolescents, regardless of the presence of self-harm. This generalisation could dilute their discriminative ability to differentiate between those who self-harm and those who do not.

In the context of multiple regression, when NSSI are measured continuously as an indicator of severity, substance use emerges as a significant factor, possibly due to its role in amplifying emotional and behavioural difficulties [13,34]. However, in dichotomous classification models (with/without NSSI), its impact is reduced, suggesting that its relevance lies in the aggravation of self-injurious behaviours rather than in their initial identification. This finding is consistent with previous studies that highlight the non-specific role of substance use as a risk factor associated with multiple psychological and behavioural problems in adolescents [24,39].

Furthermore, the impact of substance use could be related to a concurrent use of maladaptive coping strategies, such as rumination and self-blame, which increase emotional distress and self-harm [23,28]. These interactions may explain why substance use does not discriminate between adolescents with and without self-harm, but intensifies its severity.

From a practical perspective, these results suggest that substance use, although relevant in understanding the severity of NSSI, is not an adequate variable to discriminate between adolescents

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with and without these behaviours. This has important implications for clinical assessment. On the one hand, it emphasises the need to combine more specific factors, such as emotional symptomatology and self-regulation strategies, to improve the identification of adolescents at risk. On the other hand, it highlights the role of substance use as a secondary factor exacerbating NSSI rather than acting as an initial marker.

In conclusion, the inability of substance use to differentiate between adolescents with and without NSSI reflects its nature as a pervasive factor and its indirect relationship with these behaviours. This reinforces the importance of a comprehensive approach to assessment and intervention, where variables such as emotional symptomatology and maladaptive coping strategies play a central role. Furthermore, it suggests that prevention strategies should be directed not only at reducing substance use, but also at promoting emotional skills that mitigate their amplifying impact on self-harm.

An important aim of this study was to examine the role of gender in the relationships between self-harm and addictions, self-regulation and emotional symptoms (aim 4). The findings reveal that sex is a significant variable in terms of differences between boys and girls, and also in terms of differences in how predictors explain NSSI and how these predictors impact and may classify adolescents with NSSI versus without NSSI. In particular, girls showed significantly more social network addiction than boys and tended to use more rumination than boys and reported more internalising symptoms than boys. Furthermore, no significant interactions were found between sex and NSSI, suggesting the role of sex as more than a moderator of the relationships between NSSI and other factors, a factor by itself capable of explaining. For instance, less adaptive self-regulation strategies such as self-blame and rumination are able to explain the NSSI only in girls (no boys) and using maladaptive self-regulation strategies (self-blame + rumination) increased the probability of self-injury 1.07 times in girls (no boys). Subsequently, the model studied can explain more percentage of the explained variance on NSSI and also has more capacity to classify girls with/without NSSI compared to boys.

The findings are in line with the existing literature, highlighting the relationship between self-injurious behaviour (NSSI) and mental health problems such as depression and anxiety. Furthermore, it highlights the importance of associated psychological factors, such as dysfunctional self-regulatory strategies, including rumination and self-blame, which have been identified in the literature as elements linked to internalising symptoms that contribute to the development of these behaviours [13,28]. These behaviours reflect a greater tendency for girls to internalise emotional distress, a pattern also associated with a greater vulnerability to social network addiction as a coping mechanism [5,24].

Notably, this study diverges from findings identifying gender as a moderating variable in the relationship between predictors and NSSI [19,25], where gender emerges as an independent factor, suggesting that girls' higher prevalence of NSSI is intrinsically linked to their emotional and behavioural patterns, rather than being solely mediated or moderated by other predictors. This aligns with studies that propose emotional dysregulation and maladaptive coping mechanisms as central to understanding gender differences in NSSI [23].

Moreover, the inability of maladaptive self-regulatory strategies to predict NSSI in boys, in contrast to their important role in girls, calls into question gender generalisations. This finding suggests that boys may rely more on externalising behaviours, impulsivity or substance use to regulate distress, as supported by studies such as Nock et al. [10] and Del Brío Ibáñez et al. [24] Similarly, the stronger association of social network addiction with NSSI in girls points to gender differences in the way digital environments influence emotional regulation and self-injurious behaviours [39,41]. These results highlight the importance of integrating gender-sensitive approaches into both assessment and intervention. For girls, it is crucial to address maladaptive cognitive patterns and emotional vulnerability. For boys, research should focus on alternative mechanisms, such as impulsivity and externalising behaviours, in order to design effective prevention strategies.

Differences between boys and girls suggest important practical implications for clinicians and educators, particularly when designing gender-sensitive interventions to effectively address non-

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suicidal self-harm (NSSI). Girls demonstrate greater emotional vulnerability, greater reliance on maladaptive self-regulatory strategies such as rumination and self-blame, and greater susceptibility to social network addiction. These factors are strongly associated with the prevalence and severity of NSSIs among adolescent girls, as highlighted by studies such as Gámez-Guadix et al. [5] and Sánchez-Sánchez [28]. In contrast, boys tend to present externalising behaviours and impulsivity as dominant mechanisms, requiring alternative approaches to mitigate their risk factors, as pointed out by Carretero et al. [39] and Nock et al. [10]. The gendered nature of these predictors requires different strategies that are tailored to the specific vulnerabilities and coping patterns of each group.

For girls, interventions should focus on addressing maladaptive self-regulatory strategies that play a key role in the maintenance of NSSI. Furthermore, the significant role of social network addiction in NSSI among girls highlights the importance of promoting digital literacy and healthy online behaviours. Psychoeducational programmes aimed at managing the emotional impact of social networks and reducing their excessive use can mitigate their role as a maladaptive coping mechanism, as evidenced by Arab et al. [40] and Carretero et al. [39].

For boys, interventions should prioritise addressing impulsivity and externalising behaviours, which are often used as mechanisms to regulate distress. Addressing the role of substances as coping mechanisms can reduce associated risks and prevent escalation to more severe forms of self-harm [24,25].

Across genders, integrated screening for emotional symptomatology, self-regulation strategies and substance use is essential for early identification of adolescents at risk for NSSI. Comprehensive assessments that incorporate these shared risk factors can inform individualised prevention plans that are sensitive to the unique needs of boys and girls [39].

Ultimately, these findings underscore the importance of integrating gender-specific strategies to develop comprehensive prevention and intervention programmes. By addressing the emotional, cognitive and behavioural patterns associated with NSSIs in both boys and girls, these approaches offer a promising avenue for reducing their prevalence and mitigating their impact during adolescence.

This study has several limitations that need to be taken into account in order to contextualise its findings and guide future research. The cross-sectional design of this study limits its ability to establish causal relationships between the variables analysed. Although predictive and classificatory models provide relevance, this is limited to a correlational framework, identifying significant associations without determining causal pathways. Moreover, the predictive value of these models is limited to the variables included. The incorporation of unexamined factors, such as family dynamics or cultural influences, could alter the observed significance and impact of the predictors. This highlights the importance of longitudinal research to clarify causal and temporal relationships.

The study's reliance on self-reported data introduces biases, in particular social desirability, which may lead participants to underreport NSSI behaviours or emotional symptoms due to stigma. Although self-reports are widely used in psychological research, these limitations underscore the need for multi-informant approaches to validate and improve the reliability of findings. The emotional symptomatology measured in this study does not correspond to any formal clinical diagnosis, which limits the generalisability of the results. Although the predictive and classificatory models are statistically significant, their applicability is limited to the variables analysed. Future inclusion of additional predictors could alter their weights or interaction effects. Furthermore, the moderate accuracy of the models (69.7%) suggests room for improvement, which could be achieved by incorporating more nuanced variables to increase predictive accuracy.

A priority for future research should be the implementation of longitudinal studies to establish causal relationships between NSSI and associated variables such as emotional symptomatology, self-regulation strategies, and behavioural and chemical addictions. Such designs offer a deeper understanding of the chronology of risk and protective factors, allowing the identification of the stages at which interventions might be most effective. A prospective approach could also explore how NSSIs evolve from their onset in adolescence to early adulthood, considering the dynamic interplay between individual and contextual factors.

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Given the inherent limitation of using only self-reported measures, future research should adopt a multi-source assessment approach. This would include structured interviews with participants, reports from family members, validated scales administered by mental health professionals and, where possible, direct observations in natural settings. This approach would minimise social desirability bias and increase the external validity of the results. The use of tracking technologies, such as mobile apps or wearables, could also be integrated to assess self-injurious behaviours and associated emotional states in real time. To improve the generalisability of results, it is essential to work with larger and more heterogeneous samples, selected through stratified random sampling procedures that ensure representation of different socio-economic, cultural and geographical groups. International multi-centre studies could also help to identify culturally specific factors and universal variables associated with NSSIs. Additionally, it is crucial to incorporate equitable gender representation, with special attention to gender and sexual diversities, given the unequal prevalence and particularities that these populations may present in relation to NSSIs. The inclusion of participants with formal clinical diagnoses would provide a more complete picture of the impact of comorbidities on NSSI. This approach would allow the interaction between clinical symptomatology and self-injurious behaviours to be explored, providing data for the design of differentiated interventions in clinical and non-clinical populations. Future studies should address the influence of contextual factors such as the family environment, school dynamics and the use of social networks, integrating analyses that consider bidirectional interactions between these elements and NSSI. For example, the analysis of exposure to self-injurious content on social networks and its impact on the evolution of these behaviours would be a priority line of research. It is also necessary to explore the developmental trajectories of these behaviours, differentiating between those that resolve spontaneously and those that progress towards more severe or chronic behaviours. The use of advanced technology in the assessment and treatment of NSSIs also represents a promising line of research. Mobile apps, artificial intelligence tools and virtual reality platforms could be used for early detection and personalised intervention. For example, the development of programmes based on emotional regulation and digital literacy could be evaluated through controlled clinical trials measuring their effectiveness in reducing NSSIs. Finally, it is essential to design studies that evaluate the effectiveness of both universal and targeted preventive interventions. These studies should include randomised controlled trials comparing different intervention modalities, such as school-based programmes, family psychoeducation strategies and evidence-based therapies (e.g. Dialectical Behavioural Therapy and Cognitive Behavioural Therapy). Evaluating the long-term impact of these interventions will contribute to the development of more effective public policies and clinical practices.

Author Contributions: All authors, López-Martínez, Carretero, Carrasco and Pérez-García, from the Universidad Nacional de Educación a Distancia (UNED), contributed equally to all phases of the work, including conceptualization, methodology, formal analysis, research, provision of resources, data cleaning, writing of the original draft, revision and editing. All authors have reviewed and approved the final version of the manuscript.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki and was approved by the ethics committee of the Universidad Nacional de Educación a Distancia (UNED).

Informed Consent Statement: Written informed consent was obtained from all participants involved in the study (from parents or legal guardians in the case of participants under 16 years of age, and from the students themselves for those over 16 years of age).

Data Availability Statement: The data used in the study are available upon request to the corresponding author.

Conflicts of Interest: The authors declare that they have no conflicts of interest.

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