





## RESEARCH ARTICLE

# Characteristics and predictive factors of non-suicidal self-injury in patients with schizophrenia spectrum disorders

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### ABSTRACT

**Objective:** This study was designed to evaluate the characteristics and functions of non-suicidal self-injury (NSSI) in patients with schizophrenia spectrum disorders (SSD) and to investigate predictive factors of NSSI.

**Method:** A total of 102 patients aged 18-65 years with a diagnosis of SSD according to DSM-5 criteria, who were in remission were consecutively recruited for the study. Lifetime NSSI was assessed using the Inventory of Statements About Self-injury. The Positive and Negative Syndrome Scale, the Calgary Depression Scale, the Suicide Probability Scale, the Dissociation Questionnaire, the Schedule for Assessing the Three Components of Insight, and the Barratt Impulsivity Scale-11 were administered to all of the participants. Logistic regression analysis was conducted to predict NSSI.

**Results:** The prevalence of NSSI was 31.4% in our sample. Self-cutting was the most common type (26.1%), and affect regulation was the most common function of NSSI. Among the NSSI (+) group, 65.6% preferred to be alone when performing self-injurious behavior. The time between the onset of an urge to self-injure and the onset of self-injurious behavior was most often <3 hours (46.9%). Significant predictors of NSSI were a history of a suicide attempt (Odds ratio [OR]: 2.693,  $p=0.040$ , 95% confidence interval [CI]: 1.048-6.921) and a greater severity of depressive symptoms (OR: 1.216,  $p=0.001$ , 95% CI: 1.081-1.367). A history of a suicide attempt was associated with an approximately threefold increase in the risk of NSSI. The probability of suicide was higher among patients with NSSI than in patients without NSSI.

**Conclusion:** Approximately one-third of the SSD patients in this study reported NSSI. The results indicated that patients with severe depressive symptoms and a history of a suicide attempt were more at risk of injuring themselves and that the probability of suicide was higher in patients with NSSI than in patients without NSSI. A reciprocal relationship between NSSI and suicide underlines the necessity for careful investigation of both clinical situations in this patient group. Assessment of NSSI should be a part of the standard suicide risk assessment of SSD patients. Effective treatment of affective symptoms would likely help to reduce the risk of NSSI.

**Keywords:** Non-suicidal self-injury, schizophrenia spectrum disorders, suicide

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## INTRODUCTION

Intentional self-injury is a broad category that includes many forms of behavior (1). Seen both in the general and the clinical population (2), this behavior has been included as the new diagnostic category of "Personal history of self-harm" in the "Conditions for Further Study" section of The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) (3). According to this definition, non-suicidal self-injury (NSSI) is the infliction of intentional, non-fatal damage to one's own body at least five occasions in a year (3).

Acknowledged as one of the defining traits of borderline personality disorder (4), NSSI has been noted in recent years as a characteristic feature of many clinical populations, including schizophrenia spectrum disorders (SSD) (5-9). Studies of the general population have revealed that approximately 4% to 6% of adults self-injure at some point in their lives (2,10,11). The prevalence of NSSI has been reported to be higher in the clinical population (2,4,8).

The current lack of precise terminology and definitions related to NSSI and suicidal behavior in general and clinical populations (12,13) leads to difficulty with the interpretation of research results (14). Some studies have recognized NSSI as harmful actions that do not include suicidal intent (12), while in others, suicide attempts or severe injuries that may result in death have been considered within the scope of NSSI (8).

Although the DSM-5 makes a clear distinction, including the absence of a suicidal intent in the description of NSSI (3), an association between NSSI and a suicide attempt is common (11-13,15). Suicidal behavior has been observed in 55% to 85% of individuals with a history of NSSI (16), and it has been reported that an increase in the frequency of NSSI was associated with an increased risk of a suicide attempt (16,17). A relationship between suicide and NSSI has also been demonstrated in schizophrenia patients (5,8,18), and NSSI has been reported to increase the risk of suicide (7). Therefore, NSSI seems to be an important aspect on the course of SSD. It should be noted that NSSI is different from a suicide attempt (16), even if it has been considered in the same behavioral spectrum with a suicide attempt (11,12) and accepted as a predisposing factor for suicidal ideation and attempt (12). NSSI demonstrates a maladaptive coping mechanism to regulate negative emotions (12), and to endure life (4,12,19), whereas suicide attempt reflects the desire to end one's life (12).

Suicide is still one of the most common causes of death in patients with schizophrenia and is seen 12 times more frequently in psychotic patients than in the general population (20). It has been reported that 25% to 50% of patients with schizophrenia attempt suicide (21) and 2% to 5% of these patients are successful in the effort (22). Many factors, such as impulsivity (23), a high level of insight (22), substance use (24), and severe positive (25) and negative psychotic symptoms (26), have been associated with suicide risk in these patients. Depression (5,6,27) and hopelessness (21) are among the most important predictors of suicide risk in schizophrenia.

Research has shown that NSSI can be a way of coping with negative emotions and thoughts caused by a depressive mood (28,29), or as an expression of these emotions and thoughts (30). NSSI may be seen as an alternative to suicide for patients who cannot imagine their own death (12). The purpose of NSSI is typically reduce negative mood or to resolve an interpersonal difficulty (14). The self-injurious behavior provides relief (14). Apart from the affective regulation function of NSSI (28,29,31), which is most common, it has also been reported that it can serve as a means to manage a traumatic experience (32), halt dissociative experiences (4,19,28,31), inflict self-punishment (4,19,28,29,31), create a boundary between the individual and their environment (29), or increase their sense of autonomy and control (4,28,30).

Although suicidal behavior has mostly been examined, our knowledge of NSSI in patients with schizophrenia remains limited. The existing research has focused on injuries such as eye removal (33) and autoamputation (34), which are usually quite rare (18). More common forms of NSSI, such as repetitive cutting, burning, and hitting oneself, are often reported in other diagnostic groups at high risk of suicide (19), but less attention has been paid to these behaviors in studies of patients with SSD (7,18). Therefore, the aim of this study was to examine the features and functions of NSSI, including minor injuries, and to evaluate factors predicting these behaviors in SSD patients.

## METHOD

### Sample

This research was conducted at the Istanbul Bakırköy Prof. Mazhar Osman Psychiatry and Neurology Training and Research Hospital, General Psychiatry Outpatient Treatment Units. The presented work is part of a study approved by the Ethics Committee of the Istanbul Bakırköy Prof. Mazhar Osman Psychiatry and

Neurology Training and Research Hospital on September 8, 2017 (no: 47) (18) and the data were obtained from patients included in that study. The larger study (18) is an evaluation of the characteristics and predictive factors of NSSI in patients with SSD and the role of alcohol/substance use. Past and/or current alcohol/substance use was an exclusion criterion in the present study.

The diagnoses of the patients were established according to the DSM-5 in regular diagnostic consensus meetings led by an experienced psychiatrist at the hospital where the research was conducted. In addition, one of the authors of the study conducted psychiatric diagnosis interviews with the patients who participated in the study to confirm the SSD diagnosis using the DSM-5 criteria. A total of 102 consecutive patients aged 18-65 years diagnosed with SSD according to DSM-5 diagnostic criteria were included in the study. All of the participants were in remission, and were using  $\geq 1$  antipsychotic drugs (typical and atypical antipsychotics, oral or long-acting injectable form). Remission status was evaluated using the Positive and Negative Syndrome Scale (PANSS) (35); participants with a score of  $< 58$  were considered to be in remission and were included in the study (36).

All of the study participants provided written, informed consent after receiving detailed information about the study. Patients with a psychotic disorder due to organic causes and those with past and/or current substance use were excluded. All of the patients were literate.

## Materials

**Clinical and Sociodemographic Variables:** Data related to sociodemographic characteristics and clinical data (age of onset, number of hospitalizations, history of suicide attempt, etc.) were obtained using a form prepared by the researchers.

**Non-Suicidal Self-Injury:** NSSI was assessed using the Inventory of Statements About Self-Injury (ISAS). The ISAS was developed by Klonsky and Glenn (37), and the validity and reliability of a Turkish version was assessed by Bildik et al. (38). It has been used to assess NSSI in general (39) and clinical (40) populations.

The ISAS consists of 2 parts. The first section (Behaviors) measures the lifetime prevalence of 12 types of self-injurious behaviors that are intentional but not suicidal in nature. These include self-injury via cutting, biting, carving, burning, or pinching the skin; hair pulling; excessive scratching; head-banging or hitting oneself; picking at or re-opening a wound; rubbing the

skin against a rough surface; sticking oneself with a sharp object, such as a needle; and swallowing dangerous substances, usually chemicals. Participants are asked how many times they have performed each behavior. Descriptive and contextual characteristics of these behaviors are addressed with 5 additional questions (age of onset, experience of pain during NSSI, time between the urge to perform self-injury and action, whether the behavior is performed alone or in the presence of others, and whether the individual wants to stop self-injuring). Participants who have acknowledged  $\geq 1$  type of NSSI in the first part of the inventory are asked to answer the second section of the scale (Functions).

In the second section, the functions of NSSI are examined using 2 dimensions (automatic and social functions). Automatic functions are evaluated with 5 subscales: affect regulation, anti-suicide, marking distress, self-punishment, and anti-dissociation. Social functions are assessed with 8 subscales: interpersonal boundaries, interpersonal influence, revenge, sensation seeking, peer bonding, toughness, autonomy, and self-care. The questions related to each function are answered using a 3-point scale of "0-not relevant," "1-somewhat relevant," and "2-very relevant." The sum score of each subfunction provides a total social function and a total automatic function score that can be used in addition to the total ISAS score.

The ISAS was administered to all of the patients who participated in the study. Patients with  $\geq 1$  NSSI in the first part of the inventory were classified as NSSI (+) and patients without a history of NSSI were classified as NSSI (-). Only the NSSI (+) patients completed the second section of the scale.

**Rating Scales:** The PANSS (35) was used to measure the severity of psychotic symptoms and to determine remission status, the Calgary Depression Scale for Schizophrenia (CDS) (41) was used to evaluate the severity of depressive symptoms, the Suicide Probability Scale (SPS) (42) was used to assess suicidal thoughts, and the Dissociation Questionnaire (DIS-Q) (43) was administered to measure dissociative symptoms. Schedule for Assessing the Three Components of Insight (SAI) (44) was used to evaluate 3 dimensions of insight, and the Barratt Impulsiveness Scale-11 (BIS-11) (45) was used to assess impulsivity.

## Statistical Analysis

Statistical analyses were conducted using PASW Statistics for Windows, Version 18.0 software (SPSS Inc., Chicago, IL, USA). Descriptive statistics (mean,

SD, median, minimum, maximum, frequency, and percentage) were calculated. The distribution of continuous variables was evaluated using the Kolmogorov-Smirnov test. Intragroup comparisons of continuous variables were performed using the Student t-test and the Mann-Whitney U test was used for independent groups. The Pearson chi-squared test was used to compare discrete variables. Relationships between variables were evaluated using Pearson and Spearman correlation analysis. Logistic regression analysis was used to identify predictors of NSSI. Variables with a p value of <0.10 in the univariate logistic regression analysis were included as candidate variables in multivariate logistic regression analysis using the forward likelihood ratio method. Statistical significance was set at p<0.05.

## RESULTS

This study was conducted with a total of 102 patients diagnosed with SSD who were in remission and

receiving  $\geq 1$  antipsychotic medication. The patient group was 60.8% (n=62) male and 39.2% (n=40) female.

The presence of NSSI was determined using the responses to the first section of the ISAS. In all, 68.6% (n=70) of the participants reported no NSSI [NSSI (-)] and 31.4% (n=32) acknowledged NSSI behavior [NSSI (+)].

Table 1 provides details of the sociodemographic characteristics of the study participants. There was no significant difference between the groups with and without NSSI in terms of sociodemographic characteristics (p>0.05) (Table 1).

Table 2 presents the clinical characteristics of the study group. The age at onset of SSD of the group with NSSI was statistically significantly lower than that of the group without NSSI (p<0.05). No significant difference was seen between the groups in terms of the length of time from the onset of SSD to the onset of treatment of treatment (p>0.05). The history of a suicide attempt and the number of suicide attempts were statistically significantly higher in the group with NSSI when

**Table 1: Sociodemographic characteristics of patients with and without NSSI**

n=102	NSSI (-) (n=70)		NSSI (+) (n=32)		t	p
	Mean	SD	Mean	SD		
<b>*Age (years)</b>	40.60	9.868	37.28	11.422	1.499	0.137
<b>*Years of education</b>	9.96	4.070	9.56	3.671	0.468	0.641
	n	%	n	%	$\chi^2$	p
<b>**Gender</b>						
Male	42	60	20	62.5	0.058	0.831
Female	28	40	12	37.5		
<b>**Current employment</b>						
Student	4	5.7	3	9.4	1.669	0.434
Irregular/part-time	21	30	6	18.8		
Not working	45	64.3	23	71.8		
<b>**Place of residence</b>						
Urban	43	61.4	23	71.9	1.210	0.546
Suburban	20	28.6	6	18.8		
Village/town (exurban)	7	10.0	3	9.3		
<b>**Marital status</b>						
Single	50	71.4	23	71.9	0.236	0.889
Married	13	18.6	5	15.6		
Widowed/divorced	7	10.0	4	12.5		
<b>**Residential status</b>						
Alone	7	10.0	4	12.5	0.143	0.706
With family/friend	63	90.0	28	87.5		

\*Student t-test, \*\*Pearson chi-squared test. NSSI: Non-suicidal self-injury

**Table 2: Clinical characteristics of patients with and without NSSI**

n=102	NSSI (-) (n=70)		NSSI (+) (n=32)		Z	p
	Median (min-max)	Median (min-max)	Z	p		
*Age at onset of SSD (years)	21.5 (12-43)	19 (12-44)	-1.965	0.049*		
*Duration of untreated psychosis (DUP) (years)	0 (0-12)	0 (0-5)	-0.080	0.936		
*Age at first hospitalization (n=85)	25 (15-45)	23 (15-53)	-1.599	0.110		
*Total number of hospitalizations	2 (0-20)	2 (0-30)	-0.512	0.609		
*Total days of hospitalization	40 (0-450)	30 (0-500)	-0.955	0.340		
*Length of last hospitalization (days) (n=85)	15 (5-75)	15 (7-35)	-0.051	0.960		
*Number of suicide attempts	0 (0-3)	1 (0-13)	-3.308	0.001**		
	n	%	n	%	$\chi^2$	p
**History of suicide attempts						
No	50	71.4	13	40.6	8.824	0.003**
Yes	20	28.6	19	59.4		
**Suicide attempt method						
Prescription drug overdose	12	60.0	6	31.5	3.286	0.350
Jumping from height	3	15.0	4	21.1		
Using sharp objects	2	10.0	4	21.1		
Other	3	15.0	5	26.3		
**Psychiatric illness in first-degree relative						
No	50	71.4	20	62.5	0.813	0.367
Yes	20	28.6	12	37.5		

\*Mann-Whitney U test, \*\*Pearson chi-squared test. \*p<0.05; \*\*p<0.01. NSSI: Non-suicidal self-injury

compared with the group without NSSI ( $p<0.01$ ). Other clinical variables did not differ significantly between the 2 groups ( $p>0.05$ ) (Table 2).

The mean age of onset of NSSI was  $19.34\pm 8.870$  years, and the mean duration of NSSI behavior was  $10.72\pm 10.982$  years. The mean number of NSSI episodes per year was  $30.31\pm 50.932$ . The most common type of NSSI was cutting (26.1%), followed by a combination of methods (21.7%). In NSSI group, 21.9% ( $n=7$ ) stated that they did feel pain during the self-injury, 43.7% ( $n=14$ ) reported that they sometimes felt pain, and 34.4% ( $n=11$ ) reported that they did not feel pain. The results of the scale also indicated that 65.6% ( $n=21$ ) preferred to be alone when self-injuring. The time from the urge to self-injure and completion of the behavior was most often  $<3$  hours (46.9%,  $n=15$ ). Almost all of the participants who engaged in self-injury (96.8%,  $n=31$ ) reported that they wanted to stop the behavior. The primary function of NSSI was affect regulation, with a mean score of  $3.78\pm 2.166$ . Marking distress and self-punishment were the other most common functions after affect regulation. The NSSI-related traits and ISAS scores are summarized in Table 3.

The SPS scores of the groups with and without NSSI were compared. With the exception of the negative self-evaluation subscale ( $p>0.05$ ), scores of the other subscales and total scores were significantly higher in the NSSI (+) group than in the NSSI (-) group ( $p<0.05$ ) (Table 4).

The PANSS and CDS scores were used to assess the severity of psychotic and depressive symptoms, respectively. The PANSS general psychopathology subscale ( $p<0.01$ ) and the CDS total score ( $p<0.01$ ) were significantly higher in the group with NSSI than in the group without NSSI (Table 4).

All of the subscale scores as well as the total score of the DIS-Q and SAI were significantly higher in the group with NSSI ( $p<0.05$ ). There was no significant difference between the 2 groups in the BIS-11 scores ( $p>0.05$ ) (Table 4).

Logistic regression analysis was performed to identify predictors of NSSI. Following examination of the relationship to the dependent variable in a univariate logistic regression model, all of the variables with a  $p$  value of  $\leq 0.10$  were included in the multivariate model as candidate variables. The forward likelihood ratio

**Table 3: Characteristics and ISAS scores of SSD patients with self-injurious behavior**

<b>n=32</b>	<b>Min-Max</b>	<b>Mean</b>	<b>SD</b>
<b>Number of NSSI (per year)</b>	5-200	30.31	50.932
<b>Age at onset of NSSI (years) (n=32)</b>	10-45	19.34	8.870
<b>NSSI duration (years) (n=32)</b>	1-45	10.72	10.982
	<b>n</b>	<b>%</b>	
<b>NSSI type</b>			
Cutting	12	26.1	
Biting	1	2.2	
Burning	2	4.3	
Carving	2	4.3	
Pinching	2	4.3	
Hair pulling	7	15.2	
Scratching	3	6.5	
Self-hitting	7	15.2	
Wound picking	7	15.2	
Rubbing skin against rough surfaces	0	0	
Needle-sticking	2	4.3	
Swallowing chemicals	0	0	
Other	1	2.2	
Multiple methods	10	21.7	
	<b>n</b>	<b>%</b>	
<b>Other characteristics associated with self-injury</b>			
<b>Feeling pain</b>			
Yes	7	21.9	
Sometimes	14	43.7	
No	11	34.4	
<b>Being alone during self-injury</b>			
Yes	21	65.6	
Sometimes	7	21.9	
No	4	12.5	
<b>Time between desire and act of self-injury</b>			
1-3 hours	15	46.9	
3-6 hours	6	18.7	
6-12 hours	5	15.6	
12-24 hours	3	9.4	
>1 day	3	9.4	
<b>Desire to stop self-injuring</b>			
Yes	31	96.8	
No	1	3.2	
<b>ISAS</b>	<b>Min-Max</b>	<b>Mean</b>	<b>SD</b>
<b>Automatic functions</b>			
Affect regulation	0-6	3.78	2.166
Self-punishment	0-6	1.22	1.845
Antidissociation	0-6	0.91	1.553

**Table 3: Cont.**

n=32	Min-Max	Mean	SD
Antisuicide	0-6	0.72	1.571
Marking distress	0-4	1.28	1.054
Automatic functions total	0-15	7.78	4.271
<b>Social functions</b>			
Interpersonal boundaries	0-5	0.50	1.136
Interpersonal influence	0-4	0.44	0.948
Revenge	0-5	0.84	1.526
Peer bonding	0-6	0.44	1.294
Self-care	0-5	1.00	1.344
Sensation seeking	0-9	0.63	1.792
Toughness	0-4	0.91	1.201
Autonomy	0-4	0.38	0.907
Social functions total	0-18	4.91	4.645
<b>ISAS total</b>	6-21	12.81	4.060

ISAS: Inventory of Statements About Self-injury, NSSI: Non-suicidal self-injury

method was used to determine the model. The CDS score was used in the first step and a history of a suicide attempt was used in the final model in the second step (Table 5).

With all other variables constant, a one-unit increase in the CDS total score increased the probability of NSSI 1.216 times (Odds ratio [OR]=1.216,  $p=0.001$ , 95% confidence interval [CI]: 1.081-1.367), and a history of a suicide attempt increased the probability of NSSI 2.693 times (OR=2.693,  $p=0.040$ , 95% CI: 1.048-6.921) (Table 5).

The resulting classification table revealed a success of 73.5%. The multivariate model correctly identified 43.8% (specificity) of cases with NSSI and 87.1% (sensitivity) of cases without NSSI.

## DISCUSSION

The close relationship between suicide and NSSI in SSD patients is one of the most important findings of this study. We found that the history of a suicide attempt in SSD patients was associated with an approximately threefold greater risk of NSSI. The frequency of NSSI was higher in the patient group with a history of a suicide attempt compared with that of the patient group without a suicide attempt.

Studies have shown that NSSI, suicide, and suicidal behaviors are closely correlated because they are often seen together (11,12,15,46), each increases the risk of the occurrence of the other (47), and due to common genetic (46), phenomenologic features (48) with common risk

factors (12). Some researchers have reported that NSSI may be an antecedent of suicide attempts (12), which has led to discussion of a view that the 2 clinical conditions represent the two ends of the same spectrum (11,12,49,50). However, there are also studies reporting that NSSI is different from suicidal behavior in terms of function, purpose, and frequency, and that it should therefore be evaluated separately (51). At present, the DSM-5 considers NSSI and suicidal behaviors to be different clinical phenomena (3). According to the DSM-5, NSSI is defined as self-injurious behaviors that do not have a suicidal intention (3).

In this study, NSSI was evaluated using the ISAS according to the definition given in the DSM-5. The frequency of NSSI in the SSD patients was 31.4% (32/102). It has been reported that the prevalence of NSSI in SSD patients is between 30% and 50%; which varies due to different definitions, sample characteristics, and follow-up periods (8). For example, Mork et al. (8) reported the prevalence of NSSI was 48.5% in a sample which consisted both inpatients and outpatients with SSD. However, the authors defined all self-injurious behaviors, regardless of suicidal intention, as NSSI in their research. In our study, NSSI was defined as intentional self-injury causing minor or moderate physical damage to the body tissue without a conscious suicide attempt, similar to the definition used by Grandclerc et al. (12). The results of our study were similar in terms of NSSI frequency, and suggest that NSSI behaviors without the intention of death are quite common in the SSD patient group.

**Table 4: Comparison of scale scores of participants with and without NSSI**

n=102	NSSI (-)		NSSI (+)		t	p
	(n=70)		(n=32)			
*SPS	Mean	SD	Mean	SD		
+Hopelessness subscale	25.74	5.980	28.47	5.809	-2.155	0.034*
+Suicide ideation subscale	17.13	4.357	19.91	5.619	-2.721	0.008**
+Negative self-evaluation subscale	20.93	6.034	22.50	6.112	-1.215	0.227
+Hostility subscale	11.16	3.697	13.50	4.212	-2.841	0.005**
SPS total	75.03	14.440	84.38	15.803	-2.944	0.004**
<b>*PANSS</b>						
+PANSS positive	9.63	3.236	10.28	4.160	-0.862	0.391
+PANSS negative	20.59	5.112	19.22	5.210	1.246	0.216
+PANSS general	24.27	5.030	27.44	4.522	-3.041	0.003**
+PANSS total	54.54	10.343	56.88	11.324	-1.026	0.308
	Median (min-max)		Median (min-max)		Z	p
<b>**CDS total</b>	4 (0-13)		8 (0-16)		-3.864	0.000**
<b>**SAI total</b>	11 (2-14)		12 (6-14)		-2.300	0.021*
<b>**BIS-11 total</b>	60 (39-90)		65 (43-88)		-1.750	0.080
<b>**DIS-Q</b>						
++Identity confusion subscale	37 (23-80)		49.5 (27-101)		-3.179	0.001**
++Loss of control subscale	36 (18-70)		44 (22-81)		-3.129	0.002**
++Amnesia subscale	22 (14-45)		27.5 (14-54)		-2.341	0.019*
++Absorption subscale	9 (6-23)		13 (6-24)		-3.140	0.002**
<b>**DIS-Q total</b>	1.68 (1.00-3.31)		2.10 (1.17-3.82)		-3.127	0.002**

\*Student t-test, \*\*Mann-Whitney U test. \*p<0.05, \*\*p<0.01. BIS-11: Barratt Impulsivity Scale, CDS: Calgary Depression Scale, DIS-Q: Dissociation Questionnaire, PANSS: Positive and Negative Syndrome Scale, SAI: Schedule for the Assessment of Insight, SPS: Suicide Probability Scale

**Table 5: Logistic regression analysis to identify predictors of NSSI**

	B	SE	Wald	df	p	Odds ratio	95% CI	
							Lower	Upper
<b>Step 1</b>								
CDS	0.218	0.058	14.013	1	0.000	1.243	1.109	1.393
Constant	-2.227	0.477	21.846	1	0.000	0.108		
<b>Step 2</b>								
Suicide attempt history	0.991	0.482	4.232	1	0.040	2.693	1.048	6.921
CDS	0.196	0.060	10.675	1	0.001	1.216	1.081	1.367
Constant	-2.007	0.486	17.080	1	0.000	0.134		

CDS: Calgary Depression Scale for Schizophrenia, NSSI: Non-suicidal self-injury

It has been reported that NSSI is a risk factor for suicide and related behaviors (12,48,49) and may represent a 3-times greater risk of suicidal behavior (12,50). In a follow-up study, Cooper et al. (52) found that patients with NSSI had a 30-times greater risk of suicide than the general population. It has been reported that 70% of people with NSSI have attempted suicide at least once and 55% have attempted suicide

more than once (12). The research indicates that NSSI not only increases the risk of a suicide attempt, but may also be associated with the dangerousness and fatality of suicidal act (15,53). Some researchers have postulated that frequent NSSI behavior and the fact that some forms cause significant pain, could lead to experience accumulation for suicidal behaviors (11-13). According to this view, pain tolerance develops as



a result of NSSI due to the effect of endogenous opiates and endocannabinoids (54) involved in pain modulation (12,13). This may lead to more dangerous suicide attempts over time (15,53). In studies of the general population, it has been noted that the association between NSSI and suicidal behavior may also be related to the type of NSSI (11,55,56). Though every type of NSSI has the effect of increasing the risk of suicide, more severe forms (e.g., cutting, carving, or burning the skin) have been associated with a greater risk of suicide than less severe forms (e.g., hair pulling, biting) (11,55,56).

In our study, the number of those with a history of at least 1 suicide attempt in the NSSI group (59.4%) was significantly higher than that of the non-NSSI group (28.6%). The most common method in both groups was an overdose of prescription medication. The number of violent suicide attempts (e.g., using sharp objects, jumping from a height) was greater in the NSSI group when compared with the non-NSSI group, but the difference was not statistically significant. We also used the SPS to examine the probability of suicide. The SPS total score of the NSSI group was higher than that of the group without NSSI. NSSI methods were categorized in terms of violence (less violent/more violent) (55,56) and compared with the history of a suicide attempt, suicide method, number of suicide attempts, and suicide probability (SPS score), but no significant difference was found between the groups. However, a significant correlation was found between the frequency of NSSI and suicidal ideation.

It has been established that there is a strong cause-effect relationship between depression and suicidal behavior in SSD (5,6,8,22,27). Studies have also emphasized the relationship between NSSI and depressive mood (23,57), and NSSI has been described as a means of expression of negative emotions and thoughts and a method of coping (57). In our study, we found that the severity of depressive symptoms, evaluated using the CDS, was a predictive factor for NSSI. The most common function of NSSI was affect regulation, followed by marking distress and self-punishment. It could be argued that these functions of NSSI in SSD patients are associated with depressive mood and thought content. Klonsky and Olino (58) conducted a study in the general population and found that individuals who self-injure demonstrated more depression and anxiety symptoms and that NSSI functioned as a way of coping with negative emotions. In other words, it had a primarily autonomic function.

The authors also noted that those who self-injure do so more often when alone, and that this behavior was more often planned, rather than impulsive (58). In our study, the majority of patients with NSSI also preferred to be alone during self-injurious behavior and the time from the onset of the desire to self-injure and realization of the act was most often 1-3 hours. In contrast to some studies that have demonstrated an association between NSSI and impulsivity in the psychiatric population (59,60), we found no significant difference between groups with and without NSSI in terms of impulsivity in SSD patients. The results of our study seem to be consistent with the findings of Klonsky and Olino (58). It may be that NSSI is most frequently a planned method of coping with affective symptoms.

In their meta-analysis, Taylor et al. (61) found that the most common function of NSSI in the general and clinical population was affective regulation and that the intrapersonal functions of NSSI were foremost, rather than interpersonal functions. The results of our study indicated that NSSI mostly reflected intrapersonal functions in SSD patients. Greater knowledge of the purpose NSSI serves in diagnostic groups, and understanding of the relationship with clinical symptoms may be valuable to the development and application of treatment approaches.

Childhood trauma is known to be associated with many psychiatric symptoms and disorders (62,63) as well as NSSI (39,64). Traumatic experiences have been shown to be closely related to dissociative experiences and suicide in SSD (62), yet we have limited information about the relationship between dissociation and NSSI (65). Studies have highlighted the function of NSSI as a way to halt dissociative experiences (4,19,28,31) and to provide affective regulation (15) in patients with a dissociative disorder (66) or dissociative symptoms (67). Although dissociative symptoms were significantly higher in the group with NSSI than in the group without NSSI, they were not among the factors that predicted NSSI. More comprehensive studies are needed to evaluate the role of childhood trauma on the functions of NSSI in this patient group.

Young age (2), early age at onset of SSD (8), DUP (7), low socioeconomic level (68), low education level (8), being female (8), and positive (69) and negative psychotic symptoms (23) have been shown to be predictors of NSSI. No significant difference was found in our study between groups with and without NSSI in terms of sociodemographic characteristics. It was observed that the NSSI group had an earlier onset of

SSD than the group without NSSI; however, there was no significant difference between the groups in terms of DUP. In addition, no significant relationship was found between NSSI and positive and negative psychotic symptoms in our study. Although the PANSS general psychopathology score was significantly higher in the group with NSSI, its significance was lost in multivariate analysis.

A high level of insight in SSD is one of the most discussed findings related to suicide (22). It has been reported that greater insight is an indirect risk factor and may lead to depressive symptoms and increase the possibility of self-injury in this patient group (22). Although univariate analysis revealed a significantly higher level of insight in the group with NSSI, its significance was lost in multivariate analysis in our study. The findings also showed that the severity of depressive symptoms may be one of the factors directly related to self-injury.

Our study has some limitations. Although there was no statistically significant difference in terms of gender, the majority of the study sample was male. Further studies are needed to investigate possible differences in factors associated with NSSI between both genders separately in SSD patients. Our study sample consisted of patients receiving regular outpatient treatment and using antipsychotic drugs. Therefore, the results should be interpreted with caution due to the possible effects of antipsychotic medication. It should also be considered that there may be other factors that could affect NSSI in patients with poor adherence to treatment. In recent years, studies reporting that clozapine treatment is effective in reducing the risk of NSSI in the clinical population have attracted attention (70,71). Patients were not classified according to pharmacotherapy protocols in our study; therefore, the possible effects of different drug treatments, such as clozapine, on NSSI in SSD patients could not be evaluated. Although the results of our study have given insight on the relationship between NSSI and suicide and related behaviors, they should be supported by longitudinal studies with a larger study group. Finally, information about NSSI provided by patients and their relatives may be incomplete or inaccurate due to stigmatization or patient efforts to minimize the condition and to present themselves better, which might limit the reliability of our data.

The findings of our study revealed that approximately one-third of the SSD patients had engaged in NSSI, and that patients with severe depressive symptoms and

previous suicide attempts had injured themselves more frequently. In addition, patients with NSSI had a higher probability to attempt suicide. The bidirectional relationship between NSSI and suicidal behaviors demonstrates that both clinical conditions should be carefully considered in SSD patients. An assessment for NSSI should be a part of the suicide risk assessment of SSD patients. Considering the predictive effect of depressive symptoms for NSSI and the prominent affective regulation function of NSSI, we may suggest that affective symptoms should not be overlooked and that effective treatment could help reduce the risk of NSSI and probable suicide.

Contribution Categories		Author Initials
Category 1	Concept/Design	I.A., E.G.
	Data acquisition	I.A., E.G.
	Data analysis/Interpretation	I.A.
Category 2	Drafting manuscript	I.A., E.G.
	Critical revision of manuscript	I.A.
Category 3	Final approval and accountability	I.A., E.G.
Other	Technical or material support	N/A
	Supervision	N/A

**Ethics Committee Approval:** The study protocol was approved by the Ethics Committee of Bakırköy Training and Research Hospital for Psychiatry, Neurology and Neurosurgery (Turkey) (Date: 08.09.2017, Number: 47).

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