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Methods and functions of non-suicidal self-injury in an adolescent and young adult clinical sample

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Abstract

Background Non-suicidal self-injury (NSSI) is an emerging critical medical condition among adolescents and young adults worldwide. They use different methods for expressing their emotional needs. The aim of this study was to identify the methods of NSSI used by adolescents and young adults who presented with different psychiatric disorders, and their utilized functions.

Subjects/materials and methods A case–control study was done on 100 late adolescent and young adult patients who attended Suez Canal University with psychiatric disorders. Sociodemographic data was obtained then they were assessed by the Mini-International Neuropsychiatric Interview and the Brief Non-suicidal Self-Injury Assessment Tool.

Results Among the case group, 54% used scratching for self-harm while 36% used cutting. The most common body areas were hands (44%) and arms (42%). Eighty percent of the case group endorsed non-suicidal self-harm for dealing with anger, while 78% to cope with uncomfortable feelings and 72% to relieve stress with no statistically significant difference between males or females, nor among psychiatric comorbidities.

Conclusion The most common method of NSSI was scratching and it was followed by cutting and banging. The most common body areas were hands and arms. Patients endorsed NSSI for various motives and several functions. However, items on the automatic negative reinforcement scales were the most common functions, especially when dealing with anger.

Keywords Non-suicidal self-injury, Adolescence

Background

Non-suicidal self-injury is a major health concern that is prevalent among adolescents, especially in clinical samples [1]. The relevance of the utilized NSSI method comes from its relation to suicide, as Baer and colleagues in 2020 concluded in their research that cutting is associated with more suicidal attempts [2]. Cutting was reported as the most commonly utilized method,

regardless of the function [1, 3]. In a recent meta-analysis by Xiao et al. in 2022, who discovered that individuals tend to utilize numerous strategies for NSSI rather than a single method [4], banging/hitting, skin-pinching, and pulling hair were the most generally supported methods. According to studies, women prefer to use cutting, while males prefer to use beating or burning [5, 6].

The four-factor model is most commonly used to describe NSSI functionalities. It distinguishes two functional processes: social variables vs. automatic contingencies, and positive vs. negative reinforcement. This concept includes both intrapersonal (automatic) and interpersonal (social) processes that can reinforce behavior both positively and adversely. According to

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the four-factor model (FFM), NSSI is maintained by four processes: (1) automatic negative reinforcement (ANR; i.e., NSSI followed by an improvement or elimination of adverse emotions or thoughts); (2) automatic positive reinforcement (APR; i.e., NSSI followed by a boost or emergence of positive feelings or cognitions); (3) social negative reinforcement (SNR; that is, NSSI is preceding a reduction or removal of stressful social situations), and (4) social positive reinforcement (SPR; i.e., NSSI resulting in an increase or occurrence of favorable social situations) [7].

Some adolescents endorsed NSSI “to avoid their bad emotions” when adverse childhood events anticipated automatic functions. In both community and clinic samples, adolescents and adults commonly favored the self-punishment role of NSSI [8].

NSSI may be used for a variety of different aims, such as influencing others or producing a physical manifestation of mental anguish, but every application is only relevant to a subset of people who self-injure. Participating in NSSI can fulfill numerous functions that are not mutually exclusive. The most typical function of NSSI appears to be affect control. In actual fact, negative feelings such as anger, anxiety, despair, and loneliness are likely to appear before NSSI behavior, while an increase in positive emotions and an improvement in negative emotions would follow [9].

Many studies have used several methods to identify reasons for self-harm. Stress is among the most common causes of endorsing self-harm. Many studies on self-harm causes have documented answers such as “calming myself down,” “relieving anxiety,” and even avoiding dealing with emotional pain: “I wanted to take the pain away from my heart and put it elsewhere”. Another related cause is a distraction from problems or bad memories [10].

Some authors emphasized that self-punishment is an important reason for self-harm. Many anxious teens may punish themselves for wrong behavior or for losing marks in an exam (usually due to stress from parents). Interestingly, some individuals may hurt themselves as a punishment for others who care for them (such as parents, guardians, or lovers) to show them what their behavior has “forced” them to do. In the same context, Self-harm can also be carried out to elicit other’s emotions or attention. It may also reveal how much this person is loved by his caregivers, siblings, or friends [11].

Further investigation of NSSI in Egyptian adolescents is mandatory, most importantly the methods they use and the functions they serve. Acquiring enough knowledge regarding this crucial behavior positively enhances our clinical understanding, and consequently the effective implementation of personalized intervention.

Nevertheless, research into these different aspects of NSSI in our patients has received little attention in Egypt.

We hypothesized that adolescents and young adults, who have comorbid psychiatric conditions in addition to engaging in NSSI, are different from other adolescents and young adults with psychiatric disorders who do not in some characteristics. We expected also to find that NSSI methods differ vary and that they serve different functions according to those adolescents and young adults that engage in them in our sample.

Thus, the following research questions were examined:

1. Do adolescents and young adults who have psychiatric diagnoses and engage in NSSI differ in their characteristics from others who present to the clinical setting with psychiatric diagnoses but who do not engage in NSSI?
2. Do adolescents and young adults who present to clinical settings with psychiatric diagnoses and who engage in NSSI revert to certain methods than others to inflict NSSI?
3. Are there certain functions that NSSI serves for those adolescents and young adults with psychiatric diagnoses and indulge in those functions?

Methods

Participants

One hundred participants (78% female, and 22% male) were included in our study by convenience sampling, collected within the period of the beginning of 2019 till the end of 2020, 50 patients for the case group and 50 patients for the control group.

Participants were recruited from the psychiatric clinic of Suez Canal University Hospital, Ismailia, Egypt. Adolescent and young adult psychiatric patients aged 14 to 21, ($M=19.2$, $SD=1.8$) were recruited; 92% and 90% urban subjects while 8% and 10% were rural, from the cases and control groups respectively.

The case group included psychiatric patients who did self-injurious behaviors with no suicidal intent in the last 2 years (suicidal intent was ruled out by psychiatric interviewing) and agreed to join the study. The control group included matched patients of both genders, ages, and residences from the psychiatric clinic attendants, who denied any self-injurious behaviors with no suicidal intent in the last 2 years and agreed to join the study. General medical diseases were ruled out by history taking, general examination, and neurological examination. Stanford Binet test was used to rule out patients with below-average intelligence quotient (I.Q.). Suicidal intent and schizophrenia spectrum disorder were both excluded by the Mini-International Neuropsychiatric Interview (M.I.N.I.) and mental status examination. Patients

presented with psychosis were excluded as psychosis may influence the patient's responses to the self-administrated tool. It is reported also that patients who have psychosis often self-harm themselves either as a reaction to an ordering hallucination or somatic delusion, and neither is included in the list of the functions of the used tool [12].

Procedure (all participants were subjected to the following)

Each patient was given time on their own to fill in data from self-report, including the sociodemographic questionnaire and the Brief Non-Suicidal Self-Injury Assessment Tool.

Then, the patients were interviewed to collect clinician-based data by the Mini-International Neuropsychiatric Interview (M.I.N.I.).

Measures

Socio-demographics questionnaire

A short questionnaire was created to obtain participants' age, gender, residence, and educational level.

Brief non-suicidal self-injury assessment tool

The Brief Non-Suicidal Self-Injury Assessment Tool (BNSSI-AT) was used to assess N.S.S.I. characteristics, which is reliable and valid [13]. It was created by Cornell University's Research Program on Self-Injury and Recovery in 2014. An initial probing question for NSSI ("Have you ever done any of the following to intentionally hurt yourself?"). This involves 19 NSSI procedures (such as self-cutting). Respondents were considered to have carried out NSSI if they stated that they had engaged in at least one of the identified behaviors within the previous year.

Following that, participants were asked about the self-harm characteristics such as NSSI frequency and age of onset. The BNSSI-AT additionally identifies 18 NSSI functions or motives based on dynamic assessments of qualitative interviews with self-injured emerging adults, and treatment experts, along with a literature review [13]. The functions were evaluated in a binary (yes/no) manner.

These 18 functions are classified into four higher-order parameters: affective imbalance, low pressure (e.g., "I hurt myself to cope with uncomfortable feelings"); affective imbalance, high pressure (e.g., "I hurt myself to deal with frustration"); social communication and expression ("I hurt myself in the hopes that someone will notice that something is wrong or pay attention to me"); self-retribution and deterrence ("I hurt myself as self-punishment or to atone for sins").

Qualified translators used standardized translation techniques for the Arabic translation process. The back translation and pilot study were then conducted. Following that, the reverse translation and pilot study were carried out. The BNSSI-AT Arabic version was pilot tested on ten persons, who were interviewed about the problems they encountered in answering each questionnaire item. The comments were reviewed, and minor adjustments were made to the original translation. All comments were taken into account and some items have been altered to make them easier for the selected sample to read.

Mini-International Neuropsychiatric Interview (Mini)

The M.I.N.I. was developed as a clinician-based questionnaire for the DSM-IV and ICD-10 major axis I psychiatric disorders [14]. The Arabic version was tested and it is reliable and valid. It has been utilized in numerous studies in Arab nations [15].

Statistical analysis

Statistical analysis of the data was performed by the IBM SPSS software program version 20.0. The Kolmogorov–Smirnov test was applied to determine the distribution's normality. To assess variations in demographic and clinical factors, group comparisons were performed. Numbers and percentages described the qualitative data; moreover, the categorical variables were compared by the chi-square test. When more than 20% of the cells had an expected count of less than 5, Fisher exact or Monte Carlo adjustment was applied.

For normally distributed data, quantitative data were reported using range (minimum and maximum), mean, and standard deviation. While the student *t*-test was applied to compare them between both groups and an odds ratio with a 95% CI was generated to determine the association.

Results

Descriptive data

Among our sample, 91% live in urban areas while 9% live in rural ones. Concerning education, most of the sample were university students 79%, while 16% of the patients had secondary education, while 4% was the percentage of patients who had preparatory education, and 1% of them were illiterate.

Major depressive disorder was the most common comorbidity in both groups 48% and 28%; however, it was more evident in the case group with a statistically significant difference (chi-square test χ^2 6.608, *p* value 0.039). It was followed by social phobia and

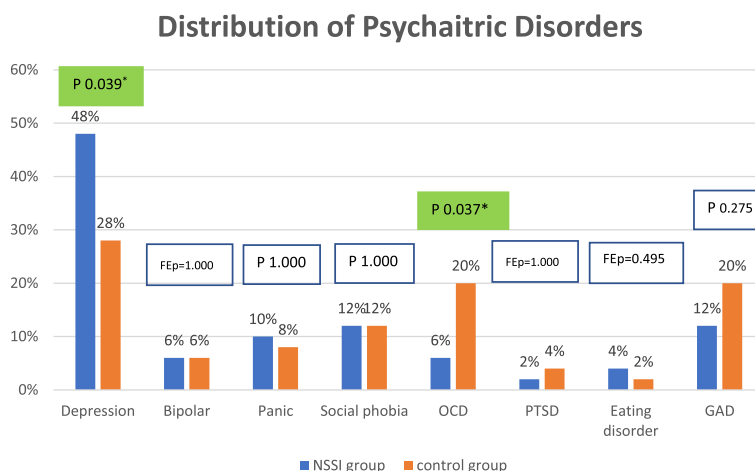


Fig. 1 Distribution of the studied sample according to psychiatric morbidity. OCD: obsessive–compulsive disorder, PTSD: posttraumatic stress disorder, GAD: generalized anxiety disorder. *Statistically significant at $p \leq 0.05$

Table 1 Descriptive analysis of the studied cases according to the age of patients regarding NSSI attempts

	Min.–max. (years)	Mean ± SD	Median (IQR)
Age of first NSSI	9.0–21.0	15.82 ± 3.15	16.0 (14.0–18.0)
Age of LAST NSSI	14.0–21.0	18.86 ± 1.69	19.0 (18.0–20.0)
Duration of NSSI	0.0–11.0	2.7 ± 2.9	2.0 (0.0–4.0)

IQR interquartile range, SD standard deviation

generalized anxiety disorder (12%). The least common comorbidity was post-traumatic stress disorder (2%). Meanwhile, OCD was the least prevalent in the case group, compared to the control group (with χ^2 4.332, p value 0.037) which was of statistical significance. The

percentage of distribution of each disorder is illustrated in (Fig. 1).

We focused our statistical analysis on the 50 patients who presented with non-suicidal self-injury to examine its characteristics; participants performed their first NSSI at the age of (9–21) with a mean of 16.18 ± 3.16 years. Moreover, their last NSSI was at the age of (14–21) with a mean of (18.88 ± 1.68) . The mean duration was 2.7 ± 2.9 years (Table 1). Within our sample, 38% had their last NSSI in the last month prior to the study (Fig. 2).

Among the sample, 12% performed NSSI only once, 40% did it 2–10 times, and 48% performed NSSI more than 10 times, as shown in Table 2. When we compared the frequency of NSSI among psychiatric comorbidities,

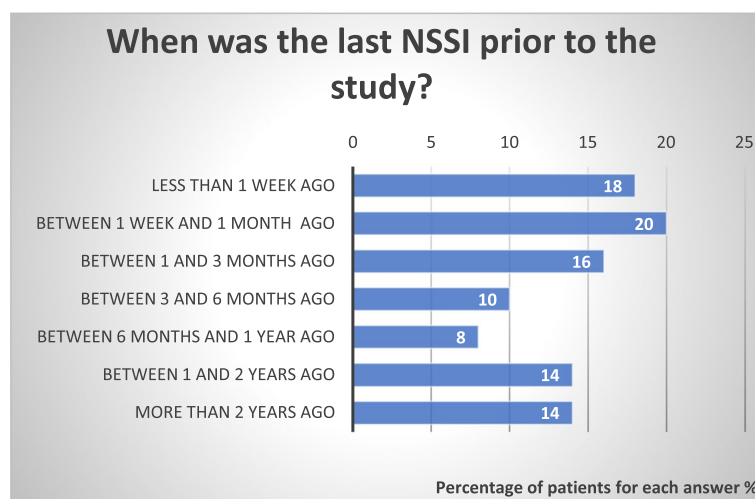


Fig. 2 Distribution of patients regarding their latest NSSI. **Figure 2** shows that almost 40% of the case group had their last NSSI in the last month prior to the study

Table 2 Frequency of non-suicidal self-injury acts among the sample

Frequency of NSSIs	No	%
Only once	6	12.0
2–3 times	7	14.0
4–5 times	4	8.0
6–10 times	9	18.0
11–20 times	7	14.0
21–50 times	11	22.0
More than 50 times	6	12.0
Only once	6	12.0
2–10 times	20	40.0
More than 10 times	24	48.0

Table 2 shows that among our sample, 48% endorsed NSSI more than 10 times

we found only patients with major depression had more frequent NSSI acts rather than once ($\chi^2=7.679$, $MCp=0.018$), as demonstrated in (Table 3).

Methods of non-suicidal self-injury

Regarding the number of the used methods of NSSI, only 38% used a single method while 62% used more than one method for endorsing NSSI, with no statistically significant difference between males and females ($\chi^2= 0.971$, $MCp=0.632$). Besides, no statistically significant difference between psychiatric comorbidities regarding the number of the used methods (Table 4).

Scratching was the most common method (54%), followed by cutting (36%) and banging objects (28%) with no statistically significant difference between males

Table 3 Frequency of NSSI in relation to psychiatric comorbidities

Comorbidity	Frequency of NSSIs						χ^2	MCp
	Only once (n=6)		2–10 times (n=20)		> 10 times (n=24)			
	No	%	No	%	No	%		
Depression	0	0.0	9	45.0	15	62.5	7.679*	0.018*
Bipolar	1	16.7	1	5.0	1	4.2	1.857	0.485
Panic	1	16.7	3	15.0	1	4.2	2.202	0.310
Social phobia	2	33.3	2	10.0	2	8.3	2.778	0.250
OCD	1	16.7	1	5.0	1	4.2	1.857	0.485
PTSD	0	0.0	1	5.0	0	0.0	1.968	0.521
Eating disorder	1	16.7	0	0.0	1	4.2	3.072	0.236
GAD	0	0.0	3	15.0	3	12.5	0.626	1.000

χ^2 chi-square test, MC Monte Carlo, p p value for comparing between different categories

* Statistically significant at $p \leq 0.05$

Table 4 Relation between the number of methods and comorbidity

	Number of methods			χ^2	p
	One method (n=19)	Two methods (n=13)	Multiple methods (n=18)		
Gender					
Male	4 (21.1%)	4 (30.8%)	3 (16.7%)	0.971	$MCp=0.632$
Female	15 (78.9%)	9 (69.2%)	15 (83.3%)		
Comorbidity					
Depression	7 (36.8%)	5 (38.5%)	12 (66.7%)	3.934	0.140
Bipolar	1 (5.3%)	0 (0.0%)	2 (11.1%)	1.404	$MCp=0.612$
Panic	2 (10.5%)	1 (7.7%)	2 (11.1%)	0.311	$MCp=1.000$
Social phobia	2 (10.5%)	3 (23.1%)	1 (5.6%)	2.119	$MCp=0.416$
OCD	2 (10.5%)	1 (7.7%)	0 (0.0%)	1.940	$MCp=0.465$
PTSD	1 (5.3%)	0 (0.0%)	0 (0.0%)	1.636	$MCp=1.000$
Eating disorder	2 (10.5%)	0 (0.0%)	0 (0.0%)	2.294	$MCp=0.331$
GAD	2 (10.5%)	3 (23.1%)	1 (5.6%)	2.119	$MCp=0.416$

χ^2 chi-square test, MC Monte Carlo, p p value for comparing between the studied groups, * Statistically significant at $p \leq 0.05$

and females. Moreover, the most common methods for females were scratching (60%), cutting (38.5%), and biting themselves (25.6%). The order of these methods was different among males, whose most common methods of NSSI were banging objects (45.5%), scratching (36.5%), and carving skin (36.5%) (Fig. 3). However, no statistically significant difference was noted between different psychiatric disorders regarding endorsing the most common NSSI methods as illustrated in (Table 5).

The most common body areas were hands (44%), followed by arms (42%), lips, and tongues (28%), while the least common was self-inflicted back injury (2%) and feet (4%) (Fig. 4).

Functions of non-suicidal self-injury

Regarding the reported reasons for engaging in non-suicidal self-injury (NSSI), our sample revealed that patients use NSSI for different and overlapping functions. The number of patients and percentage of each function are listed in Table 6 but it is worth noting that 80% used NSSI for dealing with anger, 78% used it for coping with uncomfortable feelings, and 72% used NSSI for relieving stress, with no statistically significant difference between both genders nor among different psychiatric disorders.

The listed functions were classified into 4 classes according to the four-factor model adopted by Nock and Prinstein in 2004 [16]. The classes were automatic negative reinforcement (ANR), automatic positive reinforcement (APR), social negative reinforcement (SNR), and social positive reinforcement (SPR).

Then we summed the scores of each item that belongs to each class to get the mean and standard deviation of each. We found that items of ANR ($M=3.73 \pm 2.41$ for males, $M=4.49 \pm 1.93$ for females) were used more often than other classes APR ($M=1.36 \pm 1.29$ for males, $M=1.67 \pm 1.36$ for females), SNR ($M=0.82 \pm 0.87$ for

males, $M=0.90 \pm 0.94$ for females), and SPR ($M=0.64 \pm 0.67$ for males, $M=0.85 \pm 0.78$ for females) with no statistically significant difference between males and females as shown in (Table 7).

To find the relation between NSSI functions and psychiatric comorbidities, we chose the most common function in each scale of the four-factor model to represent its class and related it to the psychiatric disorders by using the chi-square test and Fisher exact; however, no statistically significant difference was observed among the different psychiatric disorders as shown in (Table 8).

Regarding the first motive for endorsing NSSI, 24% had their first act when they were angry at someone else, while 20% were upset and wanted to try it. The percentages of patients in each motive are listed in (Fig. 5).

Discussion

To develop effective strategies for the prevention and intervention of NSSI, a better understanding of the NSSI-associated features and their perceived function is required. To the best of our knowledge, this is the first study that examines the functions and motivations of non-suicidal self-injury in late adolescence in an Egyptian clinical sample. The current study demonstrates that Egyptian adolescents and young adults endorse NSSI using a variety of methods and for various functions.

Descriptive characteristics of NSSI

Most of the participants in the case group (62%) used more than one method for self-injury. This was compatible with Poudel’s study in 2022 even though his sample was community based [17]. Notably increased number of NSSI methods is related to higher suicide risk [18]. In our study, scratching was the most common method in our group, followed by cutting. Furthermore, cutting is associated with more serious suicidal attempts [2].

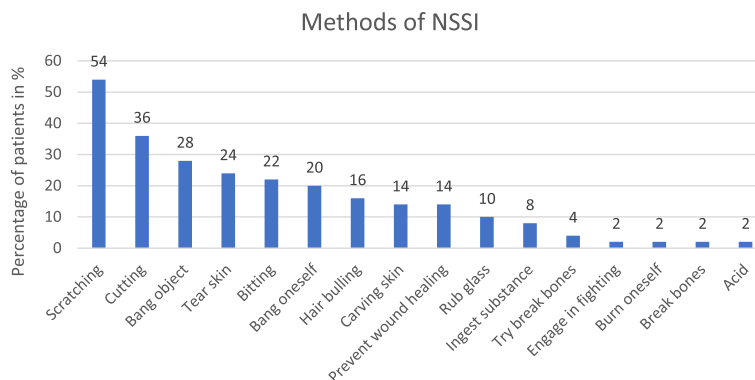


Fig. 3 Distribution of the studied cases according to methods of NSSI. Scratching was the most common method followed by cutting and banging objects

Table 5 Relation between methods of NSSIs with psychiatric comorbidity

	Methods of NSSIs					
	Scratching		Cutting		Banging objects	
	No (n = 23)	Yes (n = 27)	No (n = 32)	Yes (n = 18)	No (n = 36)	Yes (n = 14)
Gender						
Male	7 (30.4%)	4 (14.8%)	8 (25.0%)	3 (16.7%)	6 (16.7%)	5 (35.7%)
Female	16 (69.6%)	23 (85.2%)	24 (75.0%)	15 (83.3%)	30 (83.3%)	9 (64.3%)
Test of Sig. (p)	$\chi^2 = 1.766$ ($p = 0.184$)		$\chi^2 = 0.466$ ($^{FE}p = 0.724$)		$\chi^2 = 2.131$ ($^{FE}p = 0.252$)	
Depression						
No	14 (60.9%)	12 (44.4%)	17 (53.1%)	9 (50.0%)	18 (50.0%)	8 (57.1%)
Yes	9 (39.1%)	15 (55.6%)	15 (46.9%)	9 (50.0%)	18 (50.0%)	6 (42.9%)
Test of Sig. (p)	$\chi^2 = 1.342$ ($p = 0.247$)		$\chi^2 = 0.045$ ($p = 0.832$)		$\chi^2 = 0.206$ ($p = 0.650$)	
Bipolar						
No	22 (95.7%)	25 (92.6%)	30 (93.8%)	17 (94.4%)	34 (94.4%)	13 (92.9%)
Yes	1 (4.3%)	2 (7.4%)	2 (6.3%)	1 (5.6%)	2 (5.6%)	1 (7.1%)
Test of Sig. (p)	$\chi^2 = 0.206$ ($^{FE}p = 1.000$)		$\chi^2 = 0.010$ ($^{FE}p = 1.000$)		$\chi^2 = 0.045$ ($^{FE}p = 1.000$)	
Panic						
No	20 (87.0%)	25 (92.6%)	29 (90.6%)	16 (88.9%)	32 (88.9%)	13 (92.9%)
Yes	3 (13.0%)	2 (7.4%)	3 (9.4%)	2 (11.1%)	4 (11.1%)	1 (7.1%)
Test of Sig. (p)	$\chi^2 = 0.438$ ($^{FE}p = 0.651$)		$\chi^2 = 0.039$ ($^{FE}p = 1.000$)		$\chi^2 = 0.176$ ($^{FE}p = 1.000$)	
Social phobia						
No	19 (82.6%)	25 (92.6%)	28 (87.5%)	16 (88.9%)	32 (88.9%)	12 (85.7%)
Yes	4 (17.4%)	2 (7.4%)	4 (12.5%)	2 (11.1%)	4 (11.1%)	2 (14.3%)
Test of Sig. (p)	$\chi^2 = 1.172$ ($^{FE}p = 0.395$)		$\chi^2 = 0.021$ ($^{FE}p = 1.000$)		$\chi^2 = 0.096$ ($^{FE}p = 1.000$)	
OCD						
No	21 (91.3%)	26 (96.3%)	30 (93.8%)	17 (94.4%)	34 (94.4%)	13 (92.9%)
Yes	2 (8.7%)	1 (3.7%)	2 (6.3%)	1 (5.6%)	2 (5.6%)	1 (7.1%)
Test of Sig. (p)	$\chi^2 = 0.549$ ($^{FE}p = 0.588$)		$\chi^2 = 0.010$ ($^{FE}p = 1.000$)		$\chi^2 = 0.045$ ($^{FE}p = 1.000$)	
PTSD						
No	22 (95.7%)	27 (100.0%)	31 (96.9%)	18 (100%)	36 (100.0%)	13 (92.9%)
Yes	1 (4.3%)	0 (0.0%)	1 (3.1%)	0 (0%)	0 (0%)	1 (7.1%)
Test of Sig. (p)	$\chi^2 = 1.198$ ($^{FE}p = 0.460$)		$\chi^2 = 0.574$ ($^{FE}p = 1.000$)		$\chi^2 = 2.624$ ($^{FE}p = 0.280$)	
Eating disorder						
No	22 (95.7%)	26 (96.3%)	31 (96.9%)	17 (94.4%)	34 (94.4%)	14 (100%)
Yes	1 (4.3%)	1 (3.7%)	1 (3.1%)	1 (5.6%)	2 (5.6%)	0 (0%)
Test of Sig. (p)	$\chi^2 = 0.013$ ($^{FE}p = 1.000$)		$\chi^2 = 0.177$ ($^{FE}p = 1.000$)		$\chi^2 = 0.810$ ($^{FE}p = 1.000$)	
GAD						
No	21 (91.3%)	23 (85.2%)	28 (87.5%)	16 (88.9%)	32 (88.9%)	12 (85.7%)
Yes	2 (8.7%)	4 (14.8%)	4 (12.5%)	2 (11.1%)	4 (11.1%)	2 (14.3%)
Test of Sig. (p)	$\chi^2 = 0.440$ ($^{FE}p = 0.674$)		$\chi^2 = 0.021$ ($^{FE}p = 1.000$)		$\chi^2 = 0.096$ ($^{FE}p = 1.000$)	

χ^2 chi-square test, FE Fisher exact, p p value for comparing between no and yes in each methods of NSSIs

Our findings were the same as Kiekens and colleagues in 2017 found in their study [19]. Viktor et al. 2018 also found that cutting, scratching, rubbing, and pinching were the most common in their study [6]. Meanwhile, Naidoo in 2019 found in his study that interfering with wounds and pulling hair were the most common methods [20]. In Egypt, Mohammed et al. 2020 noticed that pica and nail eating were the most common methods

[21]. These studies had different mean ages; Mohammed's study's mean age group was 9.19 years, that of Kiekens's study was 20 to 30 years, and that of Victor's was 17.0 years. It may be postulated that the methods of NSSI differ with age. While younger adolescents tend to self-injure by the oral route, late adolescents prefer skin-based methods like scratching, cutting, tearing the skin, and pinching oneself. However, further research is

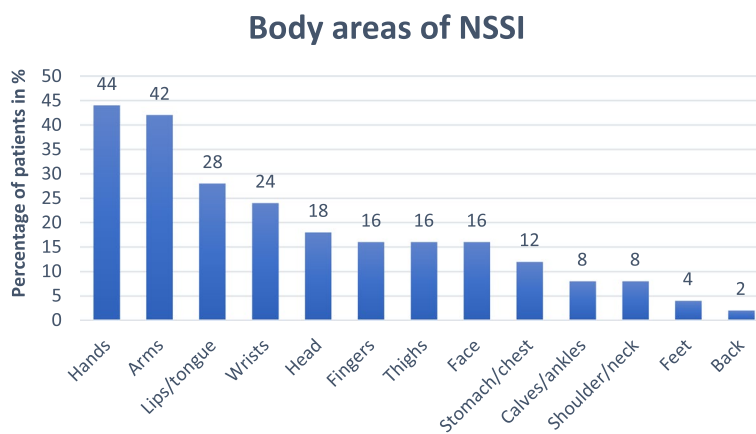


Fig. 4 Distribution of the studied cases according to body areas of NSSI. The most common body areas were hands and arms in Fig. 4

Table 6 Rate of reported reasons for engaging in minor and moderate/severe non-suicidal self-injury (NSSI)

Functions of NSSI	No. of patients	Percentage in%
Automatic-negative reinforcement		
Deal with anger	40	80
Cope with uncomfortable feeling	39	78
Relieve stress	36	72
Deal with frustration	34	68
Change emotional pain-physical	27	54
Self-hatred	23	46
Practice suicide	8	16
Attempt suicide	9	18.0
Automatic-positive reinforcement		
Self-punish	26	52
Get a rush	13	26
It's an urge	18	36
Feels good	17	34
Like the look	6	12
Social-negative reinforcement		
Avoid other harm	23	46
Avoid suicide	21	42
Social-positive reinforcement		
Get control over me	29	58
Hurt someone	11	22

Patients endorsed NSSI for several functions. However, Items on the automatic negative reinforcement scales were the most common functions, especially when dealing with anger

needed to test such a hypothesis. The most commonly endorsed body locations for NSSI were hands and arms, which is similar to the findings of previous studies [22].

We found no statistically significant difference between males and females regarding their preferred methods of NSSI. However, other studies such as Victor et al. 2018

Table 7 Comparison between males and females according to the four-factor model of NSSI

	Gender	Mean	±SD	F	p
ANR	Male	3.73	2.41	1.190	0.281
	Female	4.49	1.93		
APR	Male	1.36	1.29	0.434	0.513
	Female	1.67	1.36		
SNR	Male	0.82	0.87	0.063	0.803
	Female	0.90	0.94		
SPR	Male	0.64	0.67	0.656	0.422
	Female	0.85	0.78		

SD standard deviation, F Anova, p p value for comparing between the studied groups, *Statistically significant at $p \leq 0.05$

found scratching was more common in females than males [6].

The observation of increased NSSI acts among depressed patients elicits the concern that individuals with frequent NSSI may habituate to the unpleasant aspects (e.g., seeing blood, physical pain), and the positive aspects of hurting themselves which might be more reinforcing over time [23]. Accordingly, the increased frequency of NSSI in depressed patients might play a role in facilitating suicidal ideation and attempts. This needs further investigation, and more attention could be paid while treating depressed patients with NSSI, even in the absence of current suicidal ideation. Along with Anestis's findings in 2015, a higher frequency of NSSI is associated with suicide risk [18].

Functions and motives of NSSI

Our participants endorsed NSSI for various functions interchangeably which is another risk of suicidal attempts [24]. Moreover, it seems that it serves as a

Table 8 Relation between Functions of NSSIs with comorbidity in cases group (n = 50)

Comorbidity	Functions of NSSIs							
	Deal with anger (n = 40)		Self-punish (n = 26)		Avoid other harm (n = 23)		Get control over me (n = 29)	
	No (n = 16)	Yes (n = 34)	No (n = 24)	Yes (n = 26)	No (n = 27)	Yes (n = 23)	No (n = 21)	Yes (n = 29)
Depression								
No	10 (62.5%)	16 (47.1%)	14 (58.3%)	12 (46.2%)	14 (51.9%)	12 (52.2%)	14 (66.7%)	12 (41.4%)
Yes	6 (37.5%)	18 (52.9%)	10 (41.7%)	14 (53.8%)	13 (48.1%)	11 (47.8%)	7 (33.3%)	17 (58.6%)
Test of Sig. (p)	$\chi^2 = 1.039$ ($p = 0.308$)		$\chi^2 = 0.742$ ($p = 0.389$)		$\chi^2 = 0.001$ ($p = 1.000$)		$\chi^2 = 3.120$ ($p = 0.077$)	
Bipolar								
No	16 (100%)	31 (91.2%)	23 (95.8%)	24 (92.3%)	26 (96.3%)	21 (91.3%)	20 (95.2%)	27 (93.1%)
Yes	0 (0%)	3 (8.8%)	1 (4.2%)	2 (7.7%)	1 (3.7%)	2 (8.7%)	1 (4.8%)	2 (6.9%)
Test of Sig. (p)	$\chi^2 = 1.502$ ($FEp = 0.542$)		$\chi^2 = 0.275$ ($FEp = 1.000$)		$\chi^2 = 0.549$ ($FEp = 0.588$)		$\chi^2 = 0.098$ ($FEp = 1.000$)	
Panic								
No	14 (87.5%)	31 (91.2%)	23 (95.8%)	22 (84.6%)	26 (96.3%)	19 (82.6%)	19 (90.5%)	26 (89.7%)
Yes	2 (12.5%)	3 (8.8%)	1 (4.2%)	4 (15.4%)	1 (3.7%)	4 (17.4%)	2 (9.5%)	3 (10.3%)
Test of Sig. (p)	$\chi^2 = 0.163$ ($FEp = 0.650$)		$\chi^2 = 1.745$ ($FEp = 0.351$)		$\chi^2 = 2.585$ ($FEp = 0.167$)		$\chi^2 = 0.009$ ($FEp = 1.000$)	
Social phobia								
No	13 (81.3%)	31 (91.2%)	20 (83.3%)	24 (92.3%)	22 (81.5%)	22 (95.7%)	16 (76.2%)	28 (96.6%)
Yes	3 (18.8%)	3 (8.8%)	4 (16.7%)	2 (7.7%)	5 (18.5%)	1 (4.3%)	5 (23.8%)	1 (3.4%)
Test of Sig. (p)	$\chi^2 = 1.015$ ($FEp = 0.370$)		$\chi^2 = 0.952$ ($FEp = 0.409$)		$\chi^2 = 2.362$ ($FEp = 0.199$)		$\chi^2 = 4.782$ ($FEp = 0.070$)	
OCD								
No	14 (87.5%)	33 (97.1%)	22 (91.7%)	25 (96.2%)	26 (96.3%)	21 (91.3%)	20 (95.2%)	27 (93.1%)
Yes	2 (12.5%)	1 (2.9%)	2 (8.3%)	1 (3.8%)	1 (3.7%)	2 (8.7%)	1 (4.8%)	2 (6.9%)
Test of Sig. (p)	$\chi^2 = 1.763$ ($FEp = 0.237$)		$\chi^2 = 0.446$ ($FEp = 0.602$)		$\chi^2 = 0.549$ ($FEp = 0.588$)		$\chi^2 = 0.098$ ($FEp = 1.000$)	
PTSD								
No	16 (100%)	33 (97.1%)	24 (100.0%)	25 (96.2%)	26 (96.3%)	23 (100%)	21 (100.0%)	28 (96.6%)
Yes	0 (0%)	1 (2.9%)	0 (0%)	1 (3.8%)	1 (3.7%)	0 (0%)	0 (0%)	1 (3.4%)
Test of Sig. (p)	$\chi^2 = 0.480$ ($FEp = 1.000$)		$\chi^2 = 0.942$ ($FEp = 1.000$)		$\chi^2 = 0.869$ ($FEp = 1.000$)		$\chi^2 = 0.739$ ($FEp = 1.000$)	
Eating disorder								
No	15 (93.8%)	33 (97.1%)	23 (95.8%)	25 (96.2%)	26 (96.3%)	22 (95.7%)	20 (95.2%)	28 (96.6%)
Yes	1 (6.3%)	1 (2.9%)	1 (4.2%)	1 (3.8%)	1 (3.7%)	1 (4.3%)	1 (4.8%)	1 (3.4%)
Test of Sig. (p)	$\chi^2 = 0.310$ ($FEp = 0.542$)		$\chi^2 = 0.003$ ($FEp = 1.000$)		$\chi^2 = 0.013$ ($FEp = 1.000$)		$\chi^2 = 0.055$ ($FEp = 1.000$)	
GAD								
No	14 (87.5%)	30 (88.2%)	19 (79.2%)	25 (96.2%)	23 (85.2%)	21 (91.3%)	17 (81.0%)	27 (93.1%)
Yes	2 (12.5%)	4 (11.8%)	5 (20.8%)	1 (3.8%)	4 (14.8%)	2 (8.7%)	4 (19.0%)	2 (6.9%)
Test of Sig. (p)	$\chi^2 = 0.006$ ($FEp = 1.000$)		$\chi^2 = 3.410$ ($FEp = 0.093$)		$\chi^2 = 0.440$ ($FEp = 0.674$)		$\chi^2 = 1.703$ ($FEp = 0.223$)	

Table 8 shows that no statistically significant difference was noted between the different psychiatric comorbidities in relation to the functions of NSSI χ^2 chi-square test, FE Fisher exact, p p value for comparing between no and yes in each methods of NSSIs

copied strategy. The most common functions in our study were dealing with anger, coping with uncomfortable feelings, and relieving stress. Automatic negative reinforcement was the most evident function as we hypothesized and the most common motives for the first NSSI were dealing with negative emotions (being angry at someone else or being upset). This is consistent with Izadi-Mazidi et al. 2019 [7] who found substantial support for intra-personal, automatic functions

in their adolescent samples. It supports the conceptual theory of NSSI as a negative affect modulator [25].

We expected that the function of NSSI would be different according to the underlying psychiatric disorder, but we could not find a significant difference in the four-factor model scales of NSSI. It can be postulated that NSSI is used for affect regulation regardless of the type of psychiatric disorder.



Fig. 5 Distribution of the studied cases according to the first motive of NSSI. The most common motives were ‘being angry at someone else’ followed by ‘being upset’

One fact that might support this theory is that none of the participants sought medical help for their NSSI, but for managing their other psychiatric comorbidities, although 38% of them had injured themselves in the prior month. Further study is needed to examine the longitudinal pathway of NSSI in patients with psychiatric morbidity and whether NSSI follows or co-occurs.

Adolescents and young adults with psychiatric disorders endorse NSSI frequently, with many methods, for multiple functions, and with a high likelihood of repeating. All these factors are found to be related to increased risk of suicide in literature [2, 18, 24]. Besides, their most common methods scratching and cutting are linked to more severe suicidal attempts as well. Whereas those patients endorse self-injury with no suicidal intent, their NSSI characteristics increase their risk of attempting suicide. A fact that raises concern about the significance of assessment of NSSI characteristics in psychiatric adolescents and young adults.

Conclusions

In summary, NSSI is endorsed with various methods, mostly scratching, and cutting, and for many functions, including the automatic negative reinforcement scale, mainly dealing with anger.

Strengths, limitations, and future directions

To our knowledge, this is one of few studies that tried to further explore the intricacy of NSSI behavior in adolescents and young adults presenting with different psychiatric disorders in Egypt.

Our study provided important findings that can help in better understanding of different aspects and psychopathology of engaging in NSSI in our youth and ultimately the formulation of more effective personalized intervention plans for our patients.

Still, some caution should be applied while interpreting our study results regarding a number of limitations. The relatively small sample size, taken from one hospital, with a cross-sectional study design makes it difficult to draw any definite conclusions on the causal relationship between the various risk variables and NSSI behavior, trace changes over time or generalize our study results to a wider population. This is a case-control study with a retrospective design that relied on self-reported data, thus subjecting the results to the possibility of recall and social desirability biases, particularly for sensitive topics like NSSI. Another point to be noted was that we did not control for the psychiatric disorders with the cases in our recruited controls or use statistical tools to perform this control; this raises the concern of confounding biases. We suggest some future research directions overcome current limitations; for example, replication of similar studies on larger samples from multiple centers, with longitudinal prospective designs and better-controlled randomization should be considered. Given the sensitivity and complexity of the nature of NSSI in youth, the direction of research to qualitative study designs will better encompass the complexity of this behavior and enable the delivery of more specific individualized treatment plans.

Abbreviations

FFM	Four factor model
ANR	Automatic negative reinforcement
APR	Automatic positive reinforcement
BNSSI-AT	Brief Non-Suicidal Self-Injury Assessment Tool
CI	Confidence interval
DSM-5	Diagnostic and Statistical Manual of Mental Disorders
IQ	Intelligence quotient
MINI	Mini-International Neuropsychiatric Interview
NSSI	Non-suicidal self-injury
SNR	Social negative reinforcement
SPR	Social positive reinforcement

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Authors' contributions

Study conception and design: EA, WH, and OI. Data collection: EA. Data analysis and interpretation: EA, WH, KA, HS, and OI. Drafting of the article: EA and OI. Critical revision of the article: WH, KA, HS, and OI. The authors read and approved the final manuscript.

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Declarations**Ethics approval and consent to participate**

The study was approved by the Ethics and Clinical Research Committee of the Faculty of Medicine, Suez Canal University, with ethical approval No. 3557; on 12–09-2018. Written informed consent was obtained from each participant's legal guardian. The objectives and aims of the study were clarified to the participants. The studied subjects were informed that they had the right to withdraw from the study at any time. Besides providing them with the researcher's contact data for further communication if needed. The anonymity of the subjects was ensured.

Consent for publication

Consent for publication was obtained for every person's data included in the study.

Competing interests

The authors declare that they have no competing interests.

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