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# Adolescents With Non-Suicidal Self-Harm—Who Among Them Has Attempted Suicide?

Sudan Prasad Neupane  and Lars Mehlum 

## ABSTRACT

We aimed to determine differences between adolescents with non-suicidal self-harm with and without a history of suicide attempt (SA). Sixty-eight adolescents with a mean age of 15.6 years ( $SD = 1.5$ ) attending child and adolescent psychiatric outpatient clinics for repeated self-harm in Oslo, Norway, were included. A battery of instruments was used to assess sociodemographic information and psychopathology such as *Diagnostic and Statistical Manual of Mental Disorders* (DSM) diagnoses, emotional and behavioral problems, borderline symptoms, depression, hopelessness, suicidal ideation, and history of SA. Twenty-six participants (38.2%) reported a lifetime history of SA. Compared to the participants without a history of SA, those with an SA history had used a higher number of methods of self-harm and methods with higher lethality and had higher degrees of emotional and behavioral problems. They also scored higher in depressive symptoms, borderline pathology, emotional dysregulation, hopelessness, and suicidal ideation. History of SA was independently associated with perceived moderate to high risk of death on the most severe episode of self-harm (adjusted odds ratio [aOR], 15.93; 95% confidence interval [CI], 1.96–129.66), a longer duration (months) since self-harm debut (aOR, 1.07; 95% CI, 1.01–1.13), and suicidal ideation severity (aOR, 1.05; 95% CI, 1.01–1.11). Parental report of behavioral problems associated with SA suggested a strong association with externalizing problems. A combination of having a high level of psychopathology, externalizing problems, an extended history of self-harm behavior and use of more lethal self-harm methods seems to entail a significantly increased risk for making SAs among adolescents with non-suicidal self-harm.

## KEYWORDS

Adolescents; non-suicidal self-harm; psychopathology; self-harm; suicide attempts

## HIGHLIGHTS

- Non-suicidal self-harm (NSSH) with suicide attempt may be distinctive from NSSH without suicide attempt.
- Adolescents with NSSH with suicide attempt had relatively greater psychopathology.
- Protracted/lethal self-harm methods and externalizing problems indicate comorbidity.

## INTRODUCTION

Self-harm, commonly defined as self-poisoning or self-injury irrespective of the intent, is a major public health concern in adolescents. Approximately one in six adolescents

engage in self-harm, and half of them report repetitive self-harm episodes (Gillies et al., 2018). Internationally, 23% of adolescents reported engaging in deliberate and self-harm behaviors expressly without suicidal intent (Gillies et al., 2018). This behavior is frequently labeled non-suicidal self-injury (NSSI) and defined as intentional destruction of one's own body tissue without suicidal intent and for purposes not socially sanctioned (Nock & Favazza, 2009) or, more broadly, as non-suicidal self-harm (NSSH) encompassing self-harming behaviors such as overdosing and drowning. Both these similar, but not entirely interchangeable, concepts are used in the research literature. Most community-dwelling adolescents who engage in NSSH will never make a suicide attempt (SA) (Mars et al., 2019; Robinson, Garisch, & Wilson, 2021); however, these adolescents are nine times more likely to report attempted suicide than their non-self-harming counterparts (Gillies et al., 2018). Suicide risk is particularly high among individuals with repeated self-harm (Haw, Bergen, Casey, & Hawton, 2007; Zahl & Hawton, 2004). Within clinical samples, between 50% and 70% of adolescents with NSSH or NSSI have reported lifetime SA (Jacobson, Muehlenkamp, Miller, & Turner, 2008; Klonsky, May, & Glenn, 2013; Nock, Joiner, Gordon, Lloyd-Richardson, & Prinstein, 2006). Being able to identify which adolescents with NSSH carry an elevated risk of attempting suicide is of great clinical relevance.

In two prospective studies of depressed adolescents, recent NSSI was actually a stronger predictor of SAs over a 6-month follow-up than pre-baseline SAs themselves (Asarnow et al., 2011; Wilkinson, Kelvin, Roberts, Dubicka, & Goodyer, 2011). Other established risk factors for suicide following self-harm include suicidal intent, physical health problems, and male gender (Chan et al., 2016). In a recent longitudinal analysis of a community sample of 380 adolescents having had NSSH with no SA history by the age of 16, 12% reported at least one SA at the age of 21 years. Factors predicting SA were history of drug use, sleep problems, and lower levels of the personality type extraversion (Mars et al., 2019). In a meta-analysis, the strongest correlate of SA history among individuals with NSSI was found to be suicide ideation, followed by the moderate correlates of self-injury frequency and methods as well as hopelessness (Victor & Klonsky, 2014). Borderline personality disorder (BPD) and impulsivity were modest predictors, whereas many other variables often cited in the literature (histories of sexual and physical abuse, anxiety, substance use, and eating disorders; Mars et al., 2019; Whitlock & Knox, 2007) had a small or negligible association with SA history. The observed associations were independent of age (Victor & Klonsky, 2014). Although these studies suggest relevant diagnostic categories associated with SA in the NSSH or NSSI population, commonly employed risk scales for hopelessness and suicidal intent have not yielded robust evidence for their usage in predicting suicide following self-harm (Chan et al., 2016). This raises the question whether there are clinically discernible qualitative differences between self-harming adolescents with and without SA rather than differences in severity of underlying psychopathology. Dubious associations of variables explaining SA in NSSH samples as reported in the literature with uncertain risk estimates are likely due to methodological heterogeneity across studies (Castellví et al., 2017; Chan et al., 2016). For example, some of the differences in the reported correlates of SA in NSSH samples may be explained in terms of contextual factors, such as patient age and gender, country, social relationships, general well-being, the degree of

intentionality and intensity of self-harm, and the person's affective state (Chan et al., 2016). Assessment of these complex behaviors with considerations for time frame of reported symptoms/behaviors and using validated instruments are equally important (Castellví et al., 2017). Thus, newer studies should be designed without a restrictive selection of explanatory variables as part of an a priori hypothesis.

The nature of the associations between NSSH and suicidal behavior needs further examination, with the consideration of what factors and conditions in NSSH may increase suicide risk (Hamza, Stewart, & Willoughby, 2012). Cross-sectional studies exploring factors related to SAs in addition to NSSH among adolescents have mostly examined high school students. Results from such studies have suggested that the group with SA in addition to NSSH reports more depressive symptoms, higher suicidal ideation, fewer reasons for living, and lower self-esteem and parental support than the group that only has NSSH (Brausch & Gutierrez, 2010; Muehlenkamp & Gutierrez, 2007; Nruigham, Larsson, & Sund, 2008). Amid limited data on clinical samples of adolescents, Nock et al. (2006) reported that adolescents engaging in NSSI who also attempted suicide were differentiable from adolescents with NSSI alone by a longer history of NSSI, use of a greater number of methods, and absence of physical pain during NSSI (Nock et al., 2006). The two groups may also differ in their choice of methods of self-harm, with cutting/self-hitting being more characteristic of NSSI whereas self-poisoning/hanging were more common methods of SA (Andover & Gibb, 2010), but it may be unlikely that specific methods of self-harm independently differentiate NSSI in adolescents with and without SAs (Victor & Klonsky, 2014). Comprehensive studies exploring a broader range of clinical parameters with time variables and dimensional measures are necessary for such distinctions to emerge. Indeed, themes so subjective and volatile as emotion and emotion regulation require reliable assessments. The present study utilized a rich data set encompassing self-reported psychiatric symptoms, parent-reported behavioral problems, and clinician-observed severity measures. This novel approach of triangulating data obtained from multiple sources provides a unique opportunity to scrutinize the risk of suicidal behaviors among adolescents who self-harm. Our aim was to identify differences between adolescents with NSSH with and without a history of SA. We examined demographic and clinical characteristics, symptom severity, as well as an empirically based set of behavioral problems in order to identify specific psychopathological characteristics of clinical relevance.

## **METHODS**

### ***Participants and Procedure***

Data for this study were obtained from a randomized controlled trial of Dialectical Behavior Therapy adapted for Adolescents (DBT-A) designed to treat multi-problem self-harming adolescents with features of BPD. Participants were recruited from child and adolescent psychiatric outpatient clinics in Oslo that screened newly referred patients with recent and repetitive self-harm behavior. The study was conducted upon approval from the Regional Committee for Medical Research Ethics, South-East Norway. All patients and parents provided written informed consent before inclusion. The original study ( $N=77$ ) is registered at ClinicalTrials.gov (NCT00675129), and

methodological details are previously published (Mehlum et al., 2014). For the purpose of this study, only participants with data on lifetime SAs ( $N = 68$ ) at baseline were included. Inclusion criteria were a history of at least two episodes of self-harm, with at least one from the last 16 weeks, and at least two criteria of *Diagnostic and Statistical Manual of Mental Disorders* (DSM)-IV BPD in addition to the self-harm criterion or, alternatively, at least one criterion of DSM-IV BPD plus at least two subthreshold BPD criteria. Participants with a diagnosis of bipolar disorder (except bipolar II), schizophrenia, schizoaffective disorder, psychotic disorder not otherwise specified, intellectual disability, and Asperger syndrome were excluded. All data utilized in this study were obtained at baseline before randomization in the original trial and thus not affected by treatment. Interviews were conducted by two child and adolescent psychiatrists and two doctoral-level clinicians. Participants had a mean age of 15.6 years ( $SD = 1.5$ ; range = 12–18 years), with female overrepresentation ( $n = 60$ ; 88.2%).

### **Definition and Assessments**

Self-harm was defined as self-poisoning or self-injury irrespective of intent (Hawton, Rodham, Evans, & Weatherall, 2002), including self-harm with suicidal intent, NSSH, and self-harm episodes with unclear intent. SA was defined as self-harm with at least some suicide intent independent of the method of self-harm. Participants reporting self-harm behaviors ranging in lethality with denial of suicidal intent in retrospective report, including drowning or overdosing but no self-harm episode with an intention to die, were classified into the group of participants with NSSH. The choice of this terminology over “NSSI” was based on some participants’ designation of self-harm episodes as being non-suicidal even when the methods were drowning or overdosing, since NSSI typically does not include these two methods of self-harm (American Psychiatric Association, 2013, p. 803).

The Lifetime Parasuicide Count LPC (Linehan & Comtois, 1996) was used to obtain history and methods of self-harm including NSSH and SA. The same instrument provided data on recent SAs for which the time frame of the past 4 months was used. A semi-structured interview assessed how the participating adolescents perceived the potential lethality of their self-harming behavior. Lethality was also rated by the interviewers for the most severe episode of self-harm. The Child Behavior Checklist (CBCL; Achenbach, 2001) was used to collect data from caregiver parents to capture adolescents’ emotional and behavioral problems, whereas the same questions were answered by the adolescents using the Youth Self Report (YSR; Achenbach, 2001). The level of depressive symptoms was measured by the 13-item version of the self-report Short Mood and Feelings Questionnaire (SMFQ; Ancold & Stephen, 1995) and through the interviewer-rated 10-item Montgomery and Åsberg Depression Rating Scale (MADRS; Montgomery & Åsberg, 1979). A proxy variable for emotional dysregulation was generated by a sum score (with a range of 0–10) of the following equally weighted variables: BPD diagnostic criteria captured through the Structured Clinical Interview for DSM-IV (i.e., “affective instability” and “inappropriate anger”), YSR scale items “sudden mood swings” and “intense anger,” and the BSL item “frequent changes in the mood between

anxiety, anger, and depression.” The proxy variable had a good internal consistency ( $\alpha = .72$ ).

Diagnoses were made through a Norwegian version of the Schedule for Affective Disorders and Schizophrenia for School-Age Children-Present and Lifetime Version (K-SADS-PL; Kaufman et al., 1997), and the Structured Clinical Interview for DSM-IV (SCID-II; First, Gibbon, Spitzer, Benjamin, & Williams, 1997) was used to diagnose BPD. “Any depressive disorder” comprised major depressive disorder, dysthymic disorder, and depressive disorder not otherwise specified. The level of borderline symptoms was assessed through the 23-item self-report Borderline Symptom List (BSL-23; Bohus et al., 2007). Global level of functioning in the range of 0 to 100 was determined by using the Children’s Global Assessment Scale (C-GAS; Shaffer et al., 1983). Hopelessness was measured through the 20-item self-report Beck Hopelessness Scale (Beck, Weissman, Lester, & Trexler, 1974). The 15-item self-report Suicidal Ideation Questionnaire (SIQ-JR) was used to measure severity of suicidal ideation on a 7-point scale from “never had this thought” to “almost every day” (Reynolds & Mazza, 1999). Reasons for living were measured through the Brief Reasons for Living Inventory for Adolescents (BRFL-A; Osman et al., 1996). As previously reported, the instruments showed good to excellent reliability (Ramleth, Groholt, Diep, Walby, & Mehlum, 2017).

### **Statistical Analysis**

Between-group differences were examined by using two-tailed Student’s *t* test for continuous variables and Chi-square test for categorical variables. Results are reported as means and standard deviations unless otherwise mentioned. Multiple scale measures had non-normal distribution; hence the non-parametric alternative Mann–Whitney *U* test was used to compare the groups before confirming significance testing. A binary logistic regression model including the self-harm methods was designed to examine whether any method was significantly more closely associated with SA. Finally, odds ratios for reporting lifetime history of SA were calculated through a carefully designed model of binary logistic regression analysis using variables that showed statistical difference across groups of NSSH vs. NSSH + SA while limiting multicollinearity. Data analysis was performed with IBM Statistics 26.0 for Windows (IBM Corp, 2020).

## **RESULTS**

Twenty-six participants (38.2%) reported a lifetime history of SA in addition to NSSH. Twenty participants (29.4%) reported engaging in at least one SA during the previous 4-month period. Those with a history of SAs had a median/interquartile range (IQR) number of such attempts at 4/4.5. Fifteen participants (19.5%) were ambivalent toward death intentions in at least one self-harm episode. The most common self-harm methods associated with ambivalent death intentions were cutting ( $n = 8$ ) and overdosing ( $n = 7$ ).

Methods of self-harm across NSSH-only and NSSH + SA groups are presented in Table 1. Cutting was the most frequently used method of self-harm, with a median number of episodes using this method at 25 (IQR = 98). All participants but one

**TABLE 1.** Method of self-harm among adolescents with repeated self-harming behavior who did and did not have a lifetime history of suicide attempt.

Method	NSSH only ( <i>n</i> = 42; 61.8%)		NSSH + SA ( <i>n</i> = 26; 38.2%)		<i>p</i> value <sup>a</sup>
	<i>n</i>	%	<i>n</i>	%	
Cutting	42	100.0	25	96.2	.200
Overdosing	8	19.0	14	53.8	<b>.003</b>
Burning	7	16.7	6	23.1	.514
Strangulating/hanging	1	2.4	14	53.8	<b>&lt;.001</b>
Attempts to stop/reduce inhalation	6	14.3	11	42.3	<b>.010</b>
Drowning	1	2.4	10	38.5	<b>&lt;.001</b>
Piercing into skin	14	33.3	14	53.8	.095
Head banging or self-hitting	14	33.3	17	65.4	<b>.010</b>
Other <sup>b</sup>	8	19.0	7	26.9	.447
Use of 3 or more methods	19	45.2	24	92.3	<b>&lt;.001</b>
Use of 4 or more methods	9	21.4	18	69.2	<b>&lt;.001</b>

Note: <sup>a</sup>*p* values for the intergroup differences were calculated using  $\chi^2$  test, *p* values < .05 are set in boldface.

<sup>b</sup>Other includes swallowing inedible substances (*n* = 4; 1 in NSSH group and 3 in NSSH + SA group), jumping from height (*n* = 1 in NSSH + SA group), gunshot (*n* = 0), and unspecified method (*n* = 7 in NSSH group and *n* = 3 in the NSSH + SA group).

NSSH = non-suicidal self-harm; NSSH + SA = both non-suicidal self-harm and suicide attempt.

reported having used cutting as a method of self-harm. Head banging, self-hitting, and piercing into skin were the next most common methods in the NSSH group. The NSSH + SA group additionally reported overdosing and hanging as common methods. The single most important method distinguishing NSSH + SA from the NSSH-only group was strangulating/hanging (odds ratio [OR], 24.4; 95% confidence interval [CI], 2.3–263.1; *p* = .009). Participants in the NSSH + SA group reported using more numerous methods (median/IQR 4.5/3) compared to the NSSH-only group (median/IQR, 2/2; *p* < .001).

Differences between NSSH-only and NSSH + SA groups across sociodemographic and a broad range of clinical features (categorized as clinical indicators, self-harm variables, and measures of self-harm duration and clinical severity) are presented in Table 2. No significant sociodemographic difference was observed between the two groups. Participants in the NSSH + SA group had a significantly longer history of self-harm and were significantly more likely to have received psychopharmacotherapy. Compared to the participants in the NSSH-only group, they were also significantly more likely to satisfy the DSM-IV diagnostic criteria for any of the depressive disorders or borderline personality disorder. The scale measures of depression, borderline symptoms, emotional dysregulation, hopelessness, and suicidal ideation were significantly higher in the NSSH + SA group. The group was also more likely to have poor levels of functioning. Relatively more participants in the NSSH + SA group had higher risks of lethality associated with their most serious self-harm episode, as reported by themselves as well as the interviewer. A multivariate logistic regression model explaining 43% to 60% of the variance in group belonging suggested that participant-perceived moderate to high risk of death from the self-harm act, duration since self-harm debut, and current level of suicidal ideation were independently associated with having an SA in addition to NSSH (Table 3).

Table 4 shows differences between the NSSH-only and NSSH + SA groups across an empirically based multiple set of problems as reported by informant parents of the





**TABLE 2.** Demographic and clinical data in adolescent patients ( $N = 68$ ) with recent and repetitive self-harm according to their attribution of any self-harm episode as lifetime suicide attempt.

Characteristic	Total sample ( $N = 68$ )		NSSH only ( $n = 42$ ; 61.8%)		NSSH + SA ( $n = 26$ ; 38.2%)		$p$ value
	$N$	%	$N$	%	$N$	%	
<b>Sociodemographics</b>							
Female sex	60	88.2	38	90.5	22	84.6	.466
Norwegian ethnicity	55	85.9	36	90.0	19	79.2	.227
High school graduate	16	28.6	6	18.8	10	41.7	.060
Parents currently married	30	44.1	16	38.1	14	53.8	.204
Child protection (current)	11	16.2	4	9.5	7	26.9	.058
Child protection (past)	17	25.4	7	17.1	10	38.5	.050
<b>Clinical indicators</b>							
Past psychiatric treatment	42	63.6	23	56.1	19	76.0	.103
Past psychopharmacotherapy	7	10.3	0	0.0	7	26.7	.001
Current psychopharmacotherapy	8	11.8	1	2.4	7	26.9	.002
Family history of psychiatric disorders	37	54.4	20	47.6	17	65.4	.153
Current DSM-IV Axis I and II diagnosis							
Any depressive disorder	43	63.2	21	50.0	22	84.6	.004
Panic disorder	6	8.8	5	11.9	1	3.8	.255
Posttraumatic stress disorder	11	16.2	5	11.9	6	23.1	.224
Any anxiety disorder	33	48.5	20	47.6	13	50.0	.849
Any substance use disorder	2	2.9	0	0.0	2	7.7	.068
Any eating disorder	4	5.9	3	7.1	1	3.8	.574
Borderline personality disorder	15	22.7	6	14.3	9	37.5	.030
<b>Self-harm variables</b>							
Perceived moderate to high risk of death (participant)	23	35.4	4	10.0	19	76.0	<.001
Perceived moderate to high risk of death (interviewer)	13	21.7	2	5.4	11	47.8	<.001
Suicide attempts (median/IQR) <sup>a</sup>			–	–	4	4.5	
Non-suicidal self-harm, recent (median/IQR) <sup>a,b</sup>	27	47.5	20	40.8	35	101.5	.337
<b>Measures of self-harm duration and clinical severity</b>							
Age (years) <sup>b</sup>	15.6	1.5	15.3	1.4	16.0	1.6	.088
Age at debut of self-harm <sup>b</sup>	13.0	2.0	12.9	2.1	13.1	1.9	.487
Duration since deliberate self-harm debut (months) <sup>b</sup>	24.9	21.7	21.2	22.1	31.4	20.0	.021
Childhood-Global Assessment Scale (C-GAS) score	56.5	9.5	58.9	9.3	52.5	8.7	.007
Child Behavior Checklist (CBCL) total score, by parent	51.3	29.8	45.4	26.9	60.5	32.4	.073
Youth Self-Report (YSR) total problems raw score	72.8	26.6	71.5	26.7	74.8	27.1	.810
Borderline personality disorder criteria fulfilled <sup>b</sup>	4.0	2.0	3.0	2.0	4.0	2.0	.015
Depression (MADRS raw total score)	18.4	7.7	16.6	7.5	21.1	7.3	.019
Depression (SMFQ raw total score)	15.1	5.6	13.9	5.6	17.0	5.3	.028
Emotional dysregulation proxy scale average score <sup>b</sup>	6.0	4.0	6.0	5.0	7.5	2.8	.004
Borderline Symptom List (BSL) total score <sup>b</sup>	40.5	21.1	36.9	19.4	47.3	23.0	.044
Hopelessness (Beck Hopelessness Scale) total score	11.1	5.8	9.5	5.3	13.6	5.9	.023
Suicidal ideation (Suicidal Ideation Questionnaire-Ir)	37.4	23.9	30.2	22.8	50.6	20.2	.001
Good reasons to live	44.4	13.6	46.3	12.8	41.2	14.7	.169

Note: <sup>a</sup>Participants reporting uncountable episodes are not included.

<sup>b</sup>Presented  $p$  values are based on Mann-Whitney  $U$  test;  $p$  values < .05 are set in boldface.

NSSH = non-suicidal self-harm; NSSH + SA = both non-suicidal self-harm and suicide attempt; DSM-IV = Diagnostic and Statistical Manual of Mental Disorders, fourth edition; MADRS = Montgomery and Åsberg Depression Rating Scale; IQR = interquartile range; SMFQ = Short Mood and Feelings Questionnaire.



**TABLE 3.** Variables associated with reporting lifetime history of suicide attempt in a clinical sample of adolescents ( $N = 68$ ) with history of repeated non-suicidal self-harm.

Characteristic	Reference category	OR (95% CI)	aOR (95% CI)
Use of psychopharmacotherapy	No history	15.11 (1.73–131.6)**	
Moderate to high risk of death (participant perceived)	Low risk	28.50 (7.16–113.49)**	15.93 (1.96–129.66)**
Duration since deliberate self-harm debut (months) <sup>b</sup>		1.02 (1.01–1.05)*	1.07 (1.01–1.13)*
Childhood-Global Assessment Scale (C-GAS) score		1.09 (1.02–1.16)**	
Borderline personality disorder criteria fulfilled <sup>b</sup>		1.48 (1.07–2.07)*	
Any DSM depressive disorder	No history	1.09 (1.01–1.17)*	
Hopelessness (Beck Hopelessness Scale) total score		1.15 (1.02–1.29)*	
Suicidal ideation (Suicidal Ideation Questionnaire-Jr)		1.04 (1.01–1.07)***	1.05 (1.01–1.11)*

Note: MADRS = Montgomery and Åsberg Depression Rating Scale; OR = odds ratio; aOR = adjusted odds ratio; DSM = *Diagnostic and Statistical Manual of Mental Disorders*.

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

**TABLE 4.** Empirically based set of problems as reported by parents of adolescent patients with repeated self-harm by lifetime history of suicide attempts according to the school-age version of the Child Behavior Checklist (CBCL).

Problem	Total sample ( $N = 68$ )		NSSH only ( $n = 42$ ; 61.8%)		NSSH + SA ( $n = 26$ ; 38.2%)		$p$ value
	Mean	SD	Mean	SD	Mean	SD	
<b>Syndrome scale</b>							
Aggressive behavior	8.8	6.9	7.3	5.9	11.4	7.8	<b>.028</b>
Anxious/depressed	8.7	5.2	7.9	5.3	9.9	4.9	.154
Attention problems	5.8	4.4	5.4	4.0	6.5	4.9	.350
Rule-breaking behavior	4.7	4.8	3.6	4.1	6.5	5.4	<b>.030</b>
Somatic complaints	4.8	3.8	4.3	3.1	5.7	4.7	.169
Social problems	4.0	3.4	3.3	3.1	5.1	3.7	<b>.044</b>
Thought problems	4.5	3.9	4.9	3.6	6.1	4.2	.255
Withdrawn/depressed	5.8	3.6	5.1	3.6	6.7	3.5	.105
<b>DSM-Oriented Scale</b>							
Affective problems	10.4	5.0	9.2	4.9	12.2	4.7	<b>.022</b>
Anxiety problems	3.1	2.3	3.0	2.5	3.4	1.9	.570
Somatic problems	3.1	2.5	2.9	2.1	3.4	3.1	.445
ADHD problems	3.8	3.2	3.4	2.9	4.5	3.6	.224
Oppositional defiant	3.5	2.5	3.1	2.3	4.3	2.7	.077
Conduct problems	4.5	4.9	3.3	4.0	6.3	5.7	<b>.041</b>
<b>Broad-band scale</b>							
Internalizing problems	19.2	9.9	17.3	9.7	22.3	9.6	.06
Externalizing problems	13.6	11.0	10.9	9.5	17.8	12.1	<b>.019</b>
Total problems score	51.3	29.8	45.4	26.9	60.5	32.4	.057

Note:  $p$  values were calculated by using Student  $t$  tests.  $p$  values  $< .05$  are set in boldface.

NSSH = non-suicidal self-harm; NSSH + SA: both non-suicidal self-harm and suicide attempt; ADHD = attention deficit hyperactivity disorder; DSM = *Diagnostic and Statistical Manual of Mental Disorders*.

participants. Adolescents with a history of SA in addition to NSSH reportedly had a significantly greater degree of aggressive behavior, rule-breaking behavior, and social problems as well as significantly higher levels on the DSM-oriented scales of affective problems and conduct problems. A binary logistic regression model consisting of these variables suggested affective problems as the single most important dimension related to having an SA in addition to NSSH (OR, 1.15; 95% CI, 1.02–1.30;  $p = .021$ ). Notably, multiple dimensions of externalizing problems (i.e., aggressive behavior, rule-breaking behavior, and social problems) were closely related to having SA in addition to NSSH. In contrast to the parental reports, none of the syndrome scales as reported by the adolescents themselves were associated with NSSH + SA.

## DISCUSSION

In this study of adolescents with repeated self-harm behavior, we identified a number of clinically relevant differences between those with and without a history of SA. Adolescents with repeated NSSH who additionally reported a history of SAs presented greater severity of psychopathology such as depressive disorder, borderline personality pathology, suicidal ideation, and lower level of functioning compared to those with NSSH only. Furthermore, their self-harm behavior was of longer duration and entailed higher risks of lethality. Dimensions of emotional and behavioral problems as reported by the patients were not sufficient to distinguish between the two groups; however, parental reports of the degree of multiple sets of externalizing problems as well as affective problems in the sample were closely related to SA history in addition to NSSH.

Our finding that a longer duration of NSSH was associated with increased risk of SAs and an increased severity of the self-harm behavior is in line with previous reports (Nock et al., 2006; Victor, Styer, & Washburn, 2016; Voss et al., 2019; Willoughby, Heffer, & Hamza, 2015). Greater degree of psychopathology and the use of more numerous and potentially lethal self-harm methods associated with the NSSH + SA group should also be evaluated in the context of the longer history of self-harm in this group. Increasing symptom load in the self-harming individuals, with time, may lead to a search for new and more effective ways of reducing emotional pain or regulating other negative emotions (Nixon, Cloutier, & Aggarwal, 2002). Parallels can be drawn from findings of studies among patients with substance use disorder (Blasco-Fontecilla et al., 2016; Victor, Glenn, & Klonsky, 2012). According to Joiner's interpersonal-psychological theory of SA and suicide, the ability to self-injure is acquired through strong desire to die along with desensitization to pain and fear through repeated self-injurious behaviors (Joiner, 2007). As a corollary, patients with multiple SAs may use NSSH as a short-term strategy for self-regulating negative emotions (Esposito, Spirito, Boergers, & Donaldson, 2003). SA in the group could also be a general reflection of the disease severity characteristics, with SA being an expression of the accumulated disease severity (Cloutier, Martin, Kennedy, Nixon, & Muehlenkamp, 2010; Hamza et al., 2012; Muehlenkamp & Gutierrez, 2007; Tang et al., 2011). Indeed, the NSSH + SA group had more negative emotions to regulate and an elevated level of current suicidal ideation, indicating support for this assertion. We have previously reported that adolescents with BPD self-report significantly higher levels of depressive symptoms and suicidal ideation compared to those without BPD (Ramleth et al., 2017).

Similar to our findings, Nock et al. (2006) reported that a UK clinical sample of adolescents with NSSI who made SAs had a relatively longer history of NSSI, used a greater number of self-harm methods, and felt less physical pain during NSSI (Nock et al., 2006). Although we did not assess physical pain, we assessed subjective perception of lethality associated with the most serious episode of self-harm. We found that far more participants than interviewers attributed those episodes as being potentially fatal. This finding contrasts with those of Stanley, Gameroff, Michalsen, and Mann (2001), which suggested that individuals with NSSH + SA underestimate the lethality of their SA despite more severe depression, anxiety, and impulsivity (Stanley et al., 2001). The latter study included an adult group of people (age =  $30 \pm 10$  years) all having a cluster B (i.e., borderline, antisocial, narcissistic, or

histrionic) personality disorder who had self-harmed for a long time. It can be speculated that underestimation of lethality risks would likely appear as the sample ages, the members get more desensitized to the dangers of self-harm, and the pathology gets entrenched with long-standing self-harm. The proportion of slightly younger adolescents with NSSI ( $14.7 \pm 1.4$  years) reporting lifetime SA in the Nock et al. (2006) study was much higher compared to ours (70% vs. 38%), but relatively fewer participants (55% vs. 79%) in that study reported multiple SAs (Nock et al., 2006). The proportion of adolescents reporting SAs in our sample was similar to the community-based adolescent sample aged 16 years in the UK (36.4%) (Mars et al., 2019), indicating a more NSSH phenotype in our sample even if the inclusion criteria could have precluded less severe cases. The finding is similar to data from community samples where mean age of self-harm debut was reported to be 13 years and cutting was the most common method used (Gillies et al., 2018). In community samples, cutting and scratching are the predominant methods of self-harm in NSSH, whereas SA more commonly involves self-poisoning, hanging, and firearms (Whitlock, Eckenrode, & Silverman, 2006). Overdosing, drowning, suffocation, and hanging were also methods characteristic of our sample with SAs. Other studies suggest cutting as the most common method of self-harm in clinical NSSI samples (Andover & Gibb, 2010). Our sample did not suggest a method unique to the NSSH group; any possible associations with cutting as a distinctive method in NSSH were overshadowed by a ceiling effect since all but one participant had used cutting as a method of self-harm.

There was discordance on how the adolescents and their parents reported emotional and behavioral problems such that only the extent of parent-reported problems were associated with NSSH + SA. The reasons for this finding are unknown, but one possible explanation is that adolescents with NSSH will often perceive their emotional and behavior problems to such an extreme degree and report it in such an extreme manner that a ceiling effect is created. Nonetheless, the finding underscores the pertinence of parental reports of behavioral problems in risk assessment in these adolescents. Furthermore, it is noteworthy that NSSH itself can lead to serious tissue injury and therefore any self-harm should be taken seriously.

### ***Limitations and Strengths***

Our sample was originally selected for a clinical trial on the effect of DBT on self-harm behavior, with the predefined inclusion criteria of no fewer than two episodes of self-harm history and satisfying no fewer than two BPD criteria. Arguably, these criteria resulted in a more clinically homogenous sample. Thus, the data may not reflect associations as would be expected in community samples with a more diverse individual profiles. Although the sample was obtained from an experimental study, we exclusively used baseline data and thus the results were not subject to bias of treatment effect. Furthermore, no participant was excluded due to high suicide risk, high level of suicidal ideation, or recent suicidal behavior, which enhanced the validity of self-report data and confidence in the study findings. Finally, the sample size was relatively small, and some degree of type II error cannot be denied. We performed a large number of bivariate

analyses, which might increase the risk for some random results. However, the large selection of explanatory variables, carefully selected variables in the regression model, and a general trend for increased psychopathology in the NSSH + SA group support reliability of the findings. We utilized data reported by the patients and their parents as well as interviewer observations in the same study, which is a rare combination. The large battery of psychiatric instruments with a broad range of assessment items enabled a thorough exploration of patient profiles. The use of standardized instruments enabled international comparison. A caveat in the way patients were grouped is that we made no distinctions in the primacy or dominant behavior between NSSH and SA. Thus, adolescents grouped under NSSH + SA could well have SA with NSSH as an additional pathological behavior.

These findings demonstrate salient differences in adolescents with NSSH with and without an SA history. The absence of a clear set of diagnostic categories or a clear clinical picture attributable to SA history confirms previous concerns about the value of risk indicators for SA in NSSH populations. Psychopathological severity as a stronger correlate indicates that all patients with NSSH should receive heightened attention given the high possibility of transition from non-suicidal to suicidal self-harm in these individuals as well as the risk of severe injury in NSSH alone (Nock, 2010). The value of parental report of behavioral problems needs to be acknowledged. Future studies should recruit larger samples and attempt the development of severity scales encompassing multiple dimensions of emotional and behavioral problems that may aid clinicians to stratify suicidal risks in individuals with self-harm behaviors.

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## DATA AVAILABILITY STATEMENT

Available upon reasonable request.

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