



Research report

Clinical and psychosocial correlates of non-suicidal self-injury within a sample of children and adolescents with bipolar disorder

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ABSTRACT

Background: The purpose of this study is to examine the prevalence and correlates of non-suicidal self-injury (NSSI) among children and adolescents diagnosed with bipolar disorder (BP).

Methods: Four hundred-thirty two youth with a diagnosis of BP and their parents, including 193 children and 239 adolescents, completed a diagnostic interview and instruments to assess youth clinical and illness history, youth comorbidity, parental mood disorder, and psychosocial functioning.

Results: Approximately 22% of children and 22% of adolescents reported NSSI during the course of their most recent mood episode. In a multivariate model controlling for global impairment, among children, a BPI or BPII diagnosis (versus BPNOS), psychosis, separation anxiety disorder, and greater severity of depressive symptoms were found to be associated with NSSI. Among adolescents, a mixed episode, a suicide attempt, greater severity of depressive symptoms, and poor psychosocial functioning were found to be associated with NSSI. Neither the presence of a youth comorbid disruptive behavior disorder nor a parental mood disorder was associated with NSSI.

Limitations: The primary limitations of this study include the use of a cross-sectional study design, lack of a control group, and limited generalizability of study results to non-clinical and ethnically diverse samples.

Conclusions: NSSI is not uncommon among youth with BP, particularly those who present with BPI or BPII, psychosis, a mixed episode, suicidal behavior, severe depressive symptoms, separation anxiety, and/or poor psychosocial functioning. However, the relative importance of these factors in relation to NSSI may vary with age. Treatments for BP that are developmentally sensitive, examine the function of NSSI for each youth, and teach adaptive skills to address emotional and social needs, may prove to be most successful.

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1. Introduction

Non-suicidal self-injury (NSSI) refers to any physical self-damaging act performed without intent of killing oneself but

with full intent of inflicting physical harm to oneself (e.g., scratching, cutting, burning) (O'Carroll et al., 1996). NSSI tends to be highly repetitive, with the majority of individuals engaging in multiple episodes of the behavior (Pattison and Kahan, 1983). Prevalence estimates for NSSI range from 5–39% in community adolescent samples (Lloyd et al., 1997; Ross and Heath, 2002) to 40–61% in adolescent psychiatric inpatient

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samples (Darche, 1990; DiClemente et al., 1991). Though NSSI rates vary across studies due in part to differences in method of assessment, instruments used to assess NSSI, duration of the assessment period, and clinical severity of the population under study, NSSI is a significant clinical problem among youth, particularly because it increases risk for suicidal behavior (Brown et al., 2002).

Research conducted with adolescents has identified a number of diagnostic, affective, and psychosocial correlates of NSSI. Diagnostic correlates of NSSI in pediatric populations have been found to include depressive, anxiety, externalizing, substance use, and personality disorders (Darche, 1990; Ross and Heath, 2002; Walsh and Rosen, 1988). Mood disorder related symptoms such as suicidal ideation and psychosis have also been related to NSSI (Favazza, 1998; Muehlenkamp and Gutierrez, 2004). Negative affective states associated with NSSI among youth include feelings of hopelessness, low self-esteem, anger, hostility, and anxiety (Darche, 1990; Favazza, 1998; Favazza and Conterio, 1989; Ross and Heath, 2003; Simeon and Favazza, 2001; Walsh and Rosen, 1988). With regard to psychosocial factors, a history of abuse, adverse family circumstances (e.g., parental psychopathology) and peer conflict have been associated with NSSI among youth (Darche, 1990; Favazza and Conterio, 1989; Walsh and Rosen, 1988).

To date, the literature on the correlates of NSSI in youth are largely based on epidemiologic and unipolar depressed adolescent samples as well as heterogeneous samples of adolescent psychiatric patients. Studies conducted to date have not specifically sought to identify an association between NSSI and BP among children, adolescents, or adults. Correlates of NSSI found in heterogeneous or unipolar depressed adolescent samples may not readily apply to children or adolescents with BP due to differences in phenomenology and symptom presentation. For example, it is of clinical importance to know whether certain elements of BP (e.g., BP subtype, episode status) increase risk for NSSI. It is also important to examine models of NSSI separately in child and adolescent samples. Given biological, cognitive, and social differences between children and adolescents, it is possible that the relation between various clinical factors and NSSI may differ as a function of developmental level. To our knowledge, aside from the developmental disabilities literature, clinical correlates of NSSI in child community or clinical samples have not been examined.

The identification of clinical correlates of NSSI can be facilitated through an understanding of the function that NSSI serves in child and adolescent populations. In general, Nock and Prinstein (2004) suggest that NSSI may serve four primary functions in individuals, including automatic negative reinforcement, automatic positive reinforcement, social negative reinforcement, and social positive reinforcement. Automatic negative reinforcement refers to the use of NSSI to reduce tension or escape from other negative affective states (e.g., to stop bad feelings). Automatic positive reinforcement includes the use of NSSI to create a desirable physiologic state (e.g., to feel something even if it is pain). Social negative reinforcement is defined as the use of NSSI to escape interpersonal task demands (e.g., to avoid punishment and/or doing something unpleasant). Finally, social positive reinforcement refers to the use of NSSI to get attention from others or access to desired materials (e.g., let others know how unhappy I am and/or get a reaction out of others, even if negative).

In a study conducted to test their theory, Nock and Prinstein (2005) found that hopelessness and suicide attempts were associated with automatic negative reinforcement. Post-traumatic stress disorder was associated with automatic positive reinforcement which they suggest may reflect an attempt to induce feeling generation in an effort to compensate for symptoms of anhedonia, inactivity, and numbness. Major depressive disorder symptoms were reported to serve an automatic positive reinforcement function as well as social negative and social positive reinforcement functions. Finally, social concerns, such as socially-prescribed perfectionism (beliefs that others maintain exceedingly high standards of oneself) but not self-prescribed perfectionism (exceedingly high self-imposed standards) or loneliness, were associated with both social reinforcement functions.

Consistent with the functional model of NSSI of Nock and Prinstein (2004), it is possible that youth with BP who present with illness features and conditions associated with high emotional reactivity may engage in NSSI in an effort to reduce the intensity of feelings or for automatic negative reinforcement. In contrast, those who present with illness features and conditions associated with low emotional reactivity may engage in NSSI to induce more positive feelings or for automatic positive reinforcement. Youth with disruptive behavior disorders as well as those from social environments characterized by parental mental illness and poor psychosocial functioning, may use NSSI for social reinforcement purposes as a means to avoid punishment or criticism and/or to express their dissatisfaction with their current environmental circumstances.

The purpose of the present study is twofold. First, we sought to examine prevalence rates of NSSI in a large sample of children and adolescents with bipolar spectrum disorders, including BPI, BPII, or BP Not Otherwise Specified (BPNOS). Second, we sought to investigate clinical correlates of NSSI in this sample an effort to better understand the risk factors and function of NSSI among youth with BP. Based on the functional model of NSSI of Nock and Prinstein (2004), the following hypotheses are offered. First, given the severity of symptoms and functional impairment associated with BP, children and adolescents with BP will report rates of NSSI at least comparable to those of other youth clinical samples. Second, youth with BP who present with illness and conditions associated with high or low emotional reactivity, including BPI or BPII subtype (versus BPNOS), a full mood episode (versus partial/full inter-episode remission), a mixed episode, psychosis, a suicide attempt, severe manic symptoms, severe depressive symptoms, or an anxiety disorder, will be more likely to engage in NSSI than those without this history. Third, youth with BP who present with illness and conditions associated with adverse social circumstances, such as a disruptive behavior disorder, parental mood disorder, or poor psychosocial functioning, will be more likely to engage in NSSI than those without these conditions, though this relationship will be more robust among adolescents than children. Under these latter conditions, NSSI may be used to escape interpersonal task demands or influence ones social environment which is a concept more readily conceived of by adolescents who are more cognitively sophisticated than children. In contrast, use of NSSI to regulate high and low emotional reactivity associated with the other clinical symptoms under investigation may be easily understood and implemented by children and adolescents alike.

2. Method

2.1. Participants

Participants included 432 youth (193 children and 239 adolescents) and their parents participating in an NIMH funded, multi-site, longitudinal study on the course and outcome of bipolar youth (COBY). Participating sites include Brown University, the University of Pittsburgh Medical Center, and the University of California, Los Angeles. Participants were drawn from a baseline sample of 446 youth. Fourteen participants did not provide data on NSSI during the baseline interview and thus were not included in analyses. There were no differences in age, gender, SES, or race between the 446 youth who provided data on NSSI during the baseline interview and the 14 youth who did not provide data on NSSI. The child sample ranged in age from 7 to 11 ($M=9.02$, $SD=1.47$) and was comprised of 125 males (64.8%) and 68 females (35.2%). Approximately 84% of child participants identified themselves as White and, on average, were rated as middle class ($M=3.19$, $SD=1.18$; Hollingshead, 1975). The adolescent sample ranged in age from 12 to 17 ($M=14.68$, $SD=1.64$) and was comprised of 107 males (44.8%) and 132 females (55.2%). Approximately 80% of adolescent participants identified themselves as White and, on average, were rated as middle class ($M=3.57$, $SD=1.16$; Hollingshead, 1975).

All enrolled youth met criteria for a DSM-IV BPI, BPII, or BPNOS diagnosis. At the time of baseline assessment, 279 participants (64.6%) were in a full mood episode (major depressive, manic, hypomanic, or mixed), 93 (21.5%) were in partial remission, and 60 (13.9%) were in full inter-episode remission from their most recent episode. Among those in full inter-episode remission, the median number of weeks from the time of episode offset to baseline assessment was 18.86 ($M=40.32$, $SD=49.27$, range = 8.11–271.50). Full recovery from an episode was defined as eight consecutive weeks with minimal or no symptoms (Birmaher et al., 2009).

As the DSM-IV definition of BPNOS is not operationalized, to avoid entering youth into the study with “soft” BP symptoms, only those with a certain minimum number of symptoms and duration of mood disturbance, with and without prior depressive episodes, were considered for this diagnosis. BPNOS was defined as follows: (1) elated mood, plus two associated manic symptoms, or irritable mood plus three DSM-IV associated manic symptoms, accompanied by a change in the level of functioning; (2) mood disturbance that lasted for a minimum of 4 h within a 24-hour period; and (3) criteria 1 and 2 were met for at least 4 cumulative lifetime days. Youth diagnosed with BPNOS in the present sample have been found to have similar comorbid disorders, family histories, and longitudinal outcomes when compared to those diagnosed with BPI (Axelson et al., 2006, Birmaher et al., 2006). Moreover, about 38% of the youth diagnosed with BPNOS in the present sample have been found to convert into BPI or BPII over time (Birmaher et al., 2006). For additional details on study participants, see Birmaher et al. (2006) and Axelson et al. (2006).

2.2. Procedures

The COBY study was approved by the Institutional Review Boards at participating sites. Parallel procedures were carried out across sites. Parents and youth were enrolled into the study

through outpatient, inpatient, and community referrals, as well as advertisements. After referral to COBY, a phone screen was conducted by research staff to determine study eligibility and a baseline assessment was scheduled for all positive phone screens. Both parental consent and adolescent assent were obtained. Participants and their parents each received \$50 for completing the baseline assessment. After baseline assessment, follow-up assessments were completed every 6 months. For youth under 12 years of age, self-reports were completed with the aid of a study staff member as needed. Only data collected at the baseline assessment were used in the present study.

2.3. Measures

2.3.1. Global impairment

The Children's Global Assessment Scale (C-GAS; Shaffer et al., 1983) was used to assess global impairment. The C-GAS is a clinician-rated measure that yields excellent inter-rater reliability (Asarnow and Ben-Meir, 1988). Scores range from 1 to 100 (scores over 70 indicate normal adjustment).

2.3.2. Diagnosis and symptom severity

The Schedule for Affective Disorders and Schizophrenia for School-Age Children – Present and Lifetime Version (K-SADS-PL; Kaufman et al., 1997) was used to assess for non-mood diagnoses. It is a semi-structured diagnostic interview that provides a reliable and valid measurement of DSM-IV Axis I psychopathology in children and adolescents. The K-SADS-PL is administered to the parent first and then to the child. Both parties may be re-interviewed to resolve informant discrepancies. Test-retest reliability and kappa coefficients are in the good to excellent range across diagnoses (Kaufman et al., 1997).

The K-SADS Mania Rating Scale (K-SADS-MRS; Axelson et al., 2003) was used to assess for the presence of DSM-IV manic episodes and symptom severity. The K-SADS-MRS is a 13-item semi-structured interview that assesses manic/hypomanic symptoms experienced during the most symptomatic week over the past month and yields excellent reliability and inter-rater agreement (Axelson et al., 2003).

The Depression section (DEP-P) from the Schedule for Affective Disorders and Schizophrenia for School-Aged Children, Present Episode 4th version (K-SADS-P; Chambers et al., 1985) was used to assess for the presence of DSM-IV depressive episodes, depression symptom severity, NSSI, and suicidal behavior. The DEP-P is a 12-item semi-structured interview that assesses depressive symptoms experienced during the most symptomatic week over the past month and yields a reliable measure of depression symptom severity (Chambers et al., 1985).

2.3.3. Non-suicidal self-injury

NSSI as defined in the DEP-P refers to self-mutilation or other physical acts done *without* the intent of killing oneself. Participants are asked to indicate whether they ever tried to hurt themselves, such as burned self with matches or candles, scratched self with needles or knife or nails, put hot pennies on the skin, or another method of self-injury. They are then asked why, when, and how often they engage in this type of behavior. Behaviors that were performed in the absence of suicidal intent and occurred one or more times (i.e., coded as

mild, moderate, or severe) in the context of the most recent mood episode were coded as recent NSSI.

2.3.4. Suicide attempt

As part of the DEP-P, participants are asked to indicate whether they ever tried to kill themselves, when the act occurred, details of the act, whether they wanted to die, and how close they came to dying. Acts that occurred during the most recent mood episode were coded for seriousness and medical lethality using the DEP-P likert scale. Self-injurious acts *with* suicidal intent that included some degree of seriousness (i.e., at least definite but ambivalent) and/or lethality (i.e., at least mild) were coded as suicide attempts.

All interviews were administered by bachelor, masters, and doctoral level clinicians. All interviewers and doctoral level supervisors underwent training and certification in the K-SADS-PL, DEP-P, and MRS at each site. All cases were staffed during weekly clinical consensus team meetings at each site to confirm diagnoses. This clinical consensus team was comprised of doctoral level child psychiatrists and/or psychologists in addition to the interviewers. During this meeting, the K-SADS symptoms and medical records were reviewed. A best-estimate clinical consensus procedure was used to confirm child psychiatric diagnoses, which has been shown to yield good to excellent reliability (Cantwell et al., 1997).

2.3.5. Parental mood disorder

The Family History Screen (FHS; Weissman et al., 2000) was used to assess for the presence of parental mood disorders. The parent(s) who attended the interview answered questions about him/herself as well as their child's biological relatives. The FHS yields acceptable test-retest reliability and validity (Weissman et al., 2000).

2.3.6. Psychosocial functioning

The Psychosocial Schedule from the Adolescent Longitudinal Interval Follow-Up Evaluation (A-LIFE; Keller et al., 1987) was used to assess psychosocial functioning. The A-LIFE is a semi-structured interview used to elicit week-by-week changes in psychosocial functioning in psychiatric populations. It has sound psychometric properties (Leon et al., 2000) and has been used with other adolescent clinical populations (Phillips et al., 2006). The A-LIFE examines functioning in the area of work (including employment, academics, and household chores), interpersonal relations (including relatives and friends), recreational activities, and global satisfaction. Scores for each item range from 1 (very good) to 5 (very poor/severely impaired). The total instrument score is the sum of the impairment scores in each domain.

2.4. Data analyses

Frequency counts were conducted to examine the prevalence rates of NSSI in child and adolescent samples. A series of two-tailed *t*-tests and chi-squares were conducted to determine whether socio-demographic or potential confounding variables, youth illness and conditions associated with high or low emotional reactivity, and youth illness and conditions associated with adverse social environments, were associated with NSSI at the univariate level. To minimize type

I error rate due to multiple comparisons, a bonferroni correction was applied for analyses conducted within each domain examined. Those variables found to be significantly associated with NSSI at the univariate level were then included in a logistic regression analysis to determine the magnitude of the relations between the predictor and criterion variables when controlling for all other variables. Only variables significantly associated with NSSI at the univariate level (including trends) were included in the multivariate regression analysis to preserve degrees of freedom.

3. Results

3.1. Prevalence of NSSI

Rates of NSSI among children and adolescents were similar for the presence of lifetime ($\chi^2 = .30, p = .58$) and recent ($\chi^2 = .00, p = .99$) NSSI. Approximately 34% ($n = 58$) of children reported any NSSI during their lifetime. Of those who engaged in NSSI, 41.4% ($n = 24$) reported 1–3 instances of NSSI, 32.8% ($n = 19$) 4–11 instances, and 25.9% ($n = 15$) 12 or more instances. With regard to recent NSSI, 21.7% ($n = 42$) of children reported at least one act of NSSI during the course of their most recent mood episode. Approximately 43% ($n = 18$) of children reported 1–3 instances, 38.1% ($n = 16$) 4–11 instances, and 19% ($n = 8$) 12 or more instances of NSSI.

Approximately 37% ($n = 69$) of adolescents reported any NSSI during their lifetime. Specifically, 36.2% ($n = 25$) reported 1–3 instances, 15.9% ($n = 11$) 4–11 instances, and 47.8% ($n = 33$) 12 or more instances of NSSI. With regard to recent NSSI, 21.7% ($n = 52$) of adolescents reported at least one act of NSSI during the course of their most recent mood episode. Of those who engaged in recent NSSI, 40.4% ($n = 21$) reported 1–3 instances of NSSI, 23.1% ($n = 12$) 4–11 instances, and 36.5% ($n = 19$) 12 or more instances. As we were interested in examining correlates of NSSI that occurred concurrently within the most recent mood episode for each age group, only the recent NSSI variable was examined in the analyses that follow.

3.2. Socio-demographics and control variables

As can be seen in Table 1, the NSSI and non-NSSI groups were equivalent with regard to age, gender, race, socioeconomic status, age of onset of mood symptoms, and current use of medication for both children and adolescents. However, youth with versus without NSSI were rated as having worse global impairment (see Table 1). Therefore, global impairment was controlled for in multivariate analyses.

3.3. Illness history variables associated with high or low emotional reactivity

Among children, those with NSSI versus without NSSI had greater depression severity, greater mania severity, and higher rates of psychosis during the course of their most recent mood episode. There was also a trend for children with versus without NSSI to have higher rates of BPI or BPII diagnoses ($p = .007$) and a suicide attempt ($p = .032$). No differences were found between groups with regard to whether children were in a full mood episode (versus partial/full remission), a mixed

Table 1

Demographic and control variables by NSSI status.

	Children			Adolescents		
	NSSI	No NSSI	χ^2/t	NSSI	No NSSI	χ^2/t
	<i>N</i> = 42	<i>N</i> = 151		<i>N</i> = 52	<i>N</i> = 187	
	%/M(SD)	%/M(SD)		%/M(SD)	%/M(SD)	
Age	8.95(1.34)	9.03(1.50)	0.32	14.63(1.60)	14.70(1.65)	0.24
Gender (male)	61.9	65.6	0.19	38.5	46.5	1.07
Race (White)	90.5	82.1	1.70	84.6	78.1	1.07
SES	2.95(1.17)	3.25(1.18)	1.45	3.75(1.17)	3.52(1.15)	–1.25
Current medication	90.5	92.7	0.23	92.3	90.8	0.18
Age mood onset	5.31(1.59)	5.37(2.17)	0.18	9.94(3.66)	10.72(3.97)	1.28
Global impairment	51.14(11.68)	56.58(11.36)	2.72**	50.69(10.19)	55.01(12.64)	2.25*

* $p \leq .05$.** $p \leq .01$.

episode, or had a comorbid anxiety disorder. Among adolescents, those with NSSI versus without NSSI reported greater depression severity and were more likely to be in a mixed episode, report psychosis, and report a suicide attempt during the course of their most recent mood episode. There was also a trend for adolescents with versus without NSSI to report greater mania severity ($p = .038$). No differences were found between adolescent groups on rate of BPI or BPII diagnoses, full mood episode status, or comorbid anxiety disorder (see Table 2).

Given the significant degree of diagnostic heterogeneity within the anxiety disorder composite variable for both children (22.3% separation anxiety, 0.5% panic, 4.1% obsessive–compulsive, 5.2% social phobia, 13.0% generalized anxiety disorders, 1.6% PTSD, 32% any anxiety disorder) and adolescents (11.3% separation anxiety, 6.7% panic, 6.3% obsessive–compulsive, 5.9% social phobia, 13.8% generalized anxiety, 5.9% for PTSD, 32% any anxiety disorder), exploratory analyses were conducted to determine whether potential differences by NSSI group were masked by collapsing anxiety diagnoses. Cell sizes were only adequate to examine individual diagnoses of separation anxiety disorder and generalized anxiety disorder. Among children, youth with versus without NSSI had higher rates of separation anxiety disorder diagnoses (35.7% vs. 18.5%, $\chi^2(1) = 5.60, p = .018$). No other differences among children or adolescents were found (see Table 2).

3.4. Illness history variables/conditions associated with adverse social circumstances

3.4.1. Disruptive behavior disorder

Across both children and adolescents, the NSSI and non-NSSI groups were equivalent in rates of any disruptive behavior disorder diagnoses (see Table 3). However, given the significant degree of diagnostic heterogeneity within this composite variable among children (73.1% attention-deficit/hyperactivity, 41.5% oppositional defiant, 6.7% conduct, 78.2% any disruptive behavior disorder) and adolescents (48.5% attention-deficit/hyperactivity, 31.4% oppositional defiant, 15.1% conduct, 64.4% any disruptive behavior disorder), exploratory analyses were conducted to determine whether potential differences across NSSI groups were masked by collapsing across diagnoses. No differences among children or adolescents were found in rates of individual disruptive behavior disorder diagnoses across groups with and without NSSI.

3.4.2. Parental mood disorder

Rates of mood disorders among mothers and fathers of child participants were 34.8% and 19.8%, respectively. Rates of mood disorders among mothers and fathers of adolescent participants were 30.8% and 18.8%, respectively. The NSSI and non-NSSI groups were equivalent with regard to maternal

Table 2

Youth illness associated with high or low emotional reactivity by NSSI status.

	Children			Adolescents		
	NSSI	No NSSI	χ^2/t	NSSI	No NSSI	χ^2/t
	<i>N</i> = 42	<i>N</i> = 151		<i>N</i> = 52	<i>N</i> = 187	
	%/M(SD)	%/M(SD)		%/M(SD)	%/M(SD)	
Bipolar I/II subtype	76.2	53.0	7.27**	67.3	72.2	0.47
Full episode status	78.6	64.2	3.07	73.1	59.4	3.26
Mania severity	28.52(9.59)	21.09(11.05)	–3.96*	25.77(11.98)	21.62(12.87)	–2.09**
Depression severity	16.12(7.26)	11.34(7.58)	–3.65*	23.33(11.10)	14.26(10.70)	–5.39*
Mixed episode	19.0	07.9	03.3	25.0	09.6	08.52*
Psychosis	31.0	10.6	10.7*	34.6	10.7	17.41*
Suicide attempt	19.0	06.6	04.6**	57.7	20.3	27.92*
Anxiety disorder	40.5	29.8	1.72	38.5	30.5	1.88

df = 1 for all chi-square tests.

* Significant with bonferroni correction set at $p \leq .006$ for child and adolescent groups.** Trend ($p < .05$).

Table 3

Youth illness/conditions associated with adverse social circumstances by NSSI status.

	Children			Adolescents		
	NSSI	No NSSI	χ^2/t	NSSI	No NSSI	χ^2/t
	% (n)/ M(SD)	% (n)/ M(SD)		% (n)/ M(SD)	% (n)/ M(SD)	
DBD	81.0 (34)	77.5 (117)	0.23	67.3 (35)	63.6 (119)	0.24
Parental mood Dx						
Maternal	41.0 (16)	33.1 (48)	0.85	23.5 (12)	33.0 (58)	1.65
Paternal	17.9 (7)	20.3 (29)	0.11	28.0 (14)	16.1 (28)	3.62
Psychosocial Functioning	10.95 (3.67)	9.72 (2.80)	−2.27**	12.22 (2.67)	10.90 (3.05)	−2.77*

Note. DBD = Disruptive Behavior Disorder. $df=1$ for all chi-square tests.

* Significant with bonferonni correction set at $p \leq .016$.

** Trend ($p < .05$).

and paternal rates of mood disorders for both children and adolescents (see Table 3).

3.4.3. Psychosocial functioning

Children with versus without NSSI were rated as having worse psychosocial functioning at the trend level ($p = .025$). Adolescents with versus without NSSI were rated as having significantly worse psychosocial functioning (see Table 3).

3.5. Multivariate logistic regression analyses

Hierarchical logistic regression analyses were conducted separately for children and adolescents to examine the magnitude of the relation between variables found to be significantly associated with NSSI at the univariate level (including trends) after controlling for all other variables. Among children, after controlling for global impairment, the presence of BPI or BP/II diagnosis ($OR = 2.69$), psychosis ($OR = 3.06$), separation anxiety disorder ($OR = 2.67$), and more severe depressive symptoms ($OR = 1.07$) remained significant in the model (see Table 4). Among adolescents, after controlling for global impairment, the presence of a mixed episode ($OR = 2.96$), a suicide attempt ($OR = 3.55$), more severe depressive symptoms ($OR = 1.05$), and worse psychosocial functioning ($OR = 1.17$) remained significant

Table 4

Final model of predictors of NSSI for children with BP.

Variables	B	SE	OR	95% CI	Wald
Step 1:					
Global impairment	−.04	.02	0.97	0.93–0.99	4.44*
Step 2:					
BPI or BP/II subtype	−.99	.47	2.69	1.06–6.81	4.37*
Mixed episode	−.95	.66	0.39	0.16–1.41	2.07
Psychosis	1.12	.52	3.06	1.11–8.49	4.63*
Suicide attempt	.72	.64	2.05	0.59–7.14	1.27
Separation anxiety	.98	.46	2.67	1.09–6.58	4.58*
Depression severity	.06	.03	1.07	1.01–1.13	4.51*
Mania severity	.01	.03	1.01	0.96–1.07	0.21
Psychosocial functioning	.08	.07	1.08	0.94–1.25	1.09

* $p < .05$.

in the model as well as a trend for psychosis ($OR = 2.41$) (see Table 5).

4. Discussion

The present study examined the prevalence and clinical correlates of NSSI in a clinical sample of children and adolescents diagnosed with BP. Approximately 34% of children reported engaging in at least one episode of NSSI during their lifetime and 22% reported an act of NSSI during their most recent mood episode. Rates were similar for adolescents, with 37% reporting a lifetime history of NSSI and 22% endorsing NSSI during the course of their most recent mood episode. Consistent with study hypotheses, rates of NSSI in our clinical sample of youth with BP are higher than the 13%–23% lifetime rate observed in six different large community samples of adolescents (Jacobson and Gould, 2007), a 13% lifetime rate reported among depressed adolescent outpatients (Tiusku et al., 2006), as well as a 7.5% recent NSSI rate (last year) reported in a community sample that combined older children and young adolescents, ages 10–14 (Hilt et al., 2008). Furthermore, our findings indicate that youth with BP who engages in NSSI report does so with greater frequency than do community adolescents with NSSI (Muehlenkamp and Gutierrez, 2007). Also of importance is that this is the first study, to our knowledge, to examine NSSI in a large child psychiatric population, ages 7–11. It is also the first study to examine correlates of NSSI in a clinical sample with BP. These findings underscore the need to better understand the correlates and function of NSSI among children and adolescents with BP.

In line with the functional model of NSSI proposed by Nock and Prinstein (2004), we hypothesized that children and adolescents who presented with facets of bipolar illness and comorbidities reflective of relatively high or low emotional reactivity would be more likely to engage in NSSI than those with less extreme presentations. We also hypothesized that youth who presented with conditions that might facilitate the use of NSSI for social reinforcement purposes (e.g., parental mood disorder, psychosocial functioning) would be more likely to engage in NSSI than youth without these circumstances, particularly adolescents. Consistent with study hypotheses, among children, a diagnosis of BPI or II (versus NOS), severity of depressive and manic symptoms, psychosis, comorbid separation anxiety disorder, and psychosocial functioning (trend level) were significantly associated with NSSI at the univariate level. All variables except manic symptom severity and

Table 5

Final model of predictors of NSSI for adolescents with BP.

Variables	B	SE	OR	95% CI	Wald
Step 1:					
Global impairment	−.03	.01	0.97	0.95–0.99	4.97*
Step 2:					
Mixed episode	1.09	.51	2.96	1.09–8.05	4.54*
Psychosis	0.88	.46	2.41	0.98–5.90	3.69***
Suicide attempt	1.27	.40	3.55	1.64–7.69	10.28**
Depression severity	0.04	.02	1.05	1.01–1.08	5.88*
Mania severity	0.01	.02	1.01	0.97–1.04	0.35
Psychosocial functioning	0.15	.07	1.17	1.02–1.33	5.06*

* $p < .05$.

** $p < .01$.

*** $p < .001$.

psychosocial functioning remained significant in a multivariate model that controlled for global impairment. Also consistent with study hypotheses, among adolescents, severity of depressive symptoms, psychosis, a mixed episode, a suicide attempt, and psychosocial functioning, were significantly associated with NSSI at the univariate level. Further, all variables except psychosis remained significant in the multivariate model. Contrary to study hypotheses, neither mood episode status nor the presence of a parental mood disorder or youth comorbid disruptive behavior disorder, were associated with NSSI among children or adolescents with BP.

While our findings pertaining to mixed episodes and manic symptoms have not previously been examined in any adolescent sample, findings with regard to psychosis (Favazza, 1998), suicidal behavior, and depressive symptoms (Brunner et al., 2007; Lloyd-Richardson et al., 2007) are consistent with research conducted with inpatient and/or community adolescent samples. As suggested by Nock and Prinstein (2004), youth with BP who have severe depressive symptoms may engage in NSSI to induce more positive feelings. Moreover, those who experience psychosis and suicidal behavior may use NSSI to escape from the negative affective/cognitive states associated with these conditions. According to Joiner (2005), findings with regard to suicidal behavior may also suggest that youth with BP who engage in NSSI habituate to the fear and pain associated with self-injury which, in turn, provides them with the courage and willingness to engage in suicidal self-injury.

In contrast, a difference was not found across groups in rates of bipolar subtype for adolescents but a difference was found among children. In our sample, most children and adolescents received a BPNOS diagnosis due to insufficient symptom duration to meet DSM-IV criteria (Axelson et al., 2006), suggesting that their mood episodes were relatively brief and symptoms variable. However, across all BP subtypes, children relative to adolescents, were more likely to exhibit a high irritability/low elation profile of symptoms (Hunt et al., 2009), which can be more distressing than other profiles. As children with BPI and BPII are subject to this type of distressing profile longer than those with BPNOS, they may be more likely to engage in NSSI as a means of regulating associated emotional dysregulation. In contrast, symptom profiles exhibited by adolescents diagnosed with all subtypes of BP may be less distressing, so a longer episode may not be as disturbing for adolescents relative to children.

Also of interest are findings related to youth comorbid anxiety disorders. Separation anxiety disorder was associated with NSSI among children but not adolescents. Research suggests that symptom presentation among youth with separation anxiety disorder may vary between children and adolescents, and further that younger children tend to report more symptoms than older youth (Fisher et al., 1999; Francis et al., 1987). Therefore, these results may suggest that children with BP experience separation anxiety more intensely than adolescents and may use NSSI as a means to reduce significant distress associated with fear of separation from their home or caregiver(s). In contrast, generalized anxiety disorder was not associated with NSSI among either group of youth. These results are inconsistent with prior research that has shown an association between NSSI and other psychiatric disorders in non-bipolar specific adolescent samples (Ross and Heath, 2002; Walsh and Rosen, 1988). In

future research, it would be of interest to examine why separation anxiety, in particular, may play a more significant role in NSSI among youth with BP than other comorbidities.

In contrast to that found in non-bipolar adolescent samples (Favazza and Conterio, 1989; Walsh and Rosen, 1988), the present study also failed to find an association between NSSI and parental mood disorder or youth comorbid disruptive behavior disorder. Given the significant degree of psychosocial impairment found to accompany bipolar disorder among youth across social domains (Goldstein et al., 2009), it is possible that adverse parenting behaviors associated with parental mood disorders may not significantly worsen youth environmental conditions and thus necessitate a perceived need for NSSI. Alternatively, prior research conducted with youth with BP suggests that the effect of a parental mood disorder on the family environment may be moderated by externalizing comorbidity among youth (Esposito-Smythers et al., 2006). Therefore, the relation between parental mood disorders and NSSI may be complex among youth with BP and involve the interplay of parental and youth psychiatric symptoms.

Also of clinical importance is the association found between NSSI and psychosocial functioning in the present bipolar sample, particularly among adolescents. These results are consistent with prior research that found an association between NSSI and peer conflict (Walsh and Rosen, 1988). In line with the functional model of NSSI (Nock and Prinstein, 2004), these results may suggest that adolescents with BP who have poor psychosocial functioning may use NSSI for social reinforcement purposes as a means to avoid punishment, criticism, or expectations from others. NSSI may also represent an attempt to express dissatisfaction with current environmental circumstances or solicit assistance from others in their lives. This strategy may be more readily employed by adolescents as opposed to children who are less cognitively sophisticated. Formal reasoning and means-end oriented problem-solving skills do not fully develop until adolescence (Lochman and Dodge, 1994; Vasey and Daleiden, 1994). Future research that specifically examines the function of NSSI among children and adolescents with BP using a longitudinal design would further add to our understanding of NSSI and inform treatment research and practice.

4.1. Limitations

Given the cross-sectional nature of this study, causal associations between NSSI, clinical variables, and psychosocial functioning cannot be made. However, the knowledge that these factors are interrelated and tend to co-occur in a mood episode among youth with BP is still valuable and informative in the context of a therapeutic intervention. Second, information on Axis II symptoms in the sample was not obtained at intake. Given that NSSI is a diagnostic criterion for borderline personality disorder, and that bipolar and borderline personality disorders share multiple clinical features, it is possible that youth with BP who engage in NSSI may have comorbid borderline personality pathology or may be exhibiting symptoms indicative of a developmental trajectory toward an Axis II disorder. However, it should be noted that there exists some question about whether Axis II disorders can be accurately diagnosed in the presence of severe Axis I symptoms (Zanarini et al., 1998) or within childhood (Miller et al. 2008). Alternatively, these findings may

provide evidence to suggest that these diagnoses lie along a continuum of mood disorder (Akiskal, 2004). Third, as the sample predominantly included White youth, results may not readily generalize to youth of other races with different cultural values. Fourth, youth and their parents provided retrospective reports of functioning. It is possible that negative recall bias influenced the ratings of functioning. Fifth, due to small cell sizes, we were unable to examine the relation between NSSI and other forms of youth comorbidity (e.g., substance abuse) and parental psychopathology in the present study. Sixth, this study lacks a psychiatric control group. Last, the sample is largely a clinical outpatient sample and thus may not be representative of epidemiologic samples of youth with BP. However, in comparing diagnostic data from the 14 to 18 year olds included in the present study to that from an epidemiological sample (Lewinsohn et al. 2005), which also employed the K-SADS, the teens with BP are comparable in lifetime rates of suicide attempts (40% vs. 44%), anxiety disorders (39% vs. 33%) and substance use disorders (both 22%). The main difference found between the samples was a relatively higher rate of disruptive behavior disorders in the present bipolar sample as compared to the Lewinsohn et al. (2005) sample (62% vs. 22%).

4.2. Conclusions

Given the high rates of NSSI found among youth with BP, clinical providers should routinely screen children and adolescents with BP for this behavior. Those who present with psychosis, a mixed episode, severe depressive symptoms, suicidality, and/or relatively poor psychosocial functioning may be at particularly high risk for NSSI. Children diagnosed with BPI or BPII subtype and/or separation anxiety disorder may also be at greater risk for NSSI. If present, psychosocial interventions geared toward understanding the function of NSSI and aiding the child/adolescent in the development of more effective methods to meet his/her emotional and social needs may prove efficacious. Different therapeutic approaches may be necessary based on the different functions of NSSI and the developmental level of youth with BP.

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Conflicts of interest

All authors declare that they have no conflicts of interest with the publication of this paper.

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