

An Exploratory Study of Correlates, Onset, and Offset of Non-Suicidal Self-Injury

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The study of non-suicidal self-injury (NSSI) has focused largely on identifying diagnostic correlates and the functions of this behavior; however, little is known about the broader range of factors related to NSSI. We examined a wide array of factors hypothesized to correlate with non-suicidal self-injury (NSSI) and provided a qualitative analysis of adolescents' self-reported motivations for starting and stopping this behavior. Participants were 64 adolescents with a history of NSSI and 30 comparison adolescents without such a history matched on age, sex, and ethnicity recruited from the community and assessed during one laboratory visit. The presence of NSSI was associated with a family history of suicidal ideation, violence, and drug and alcohol abuse, but not with more general forms of psychopathology. NSSI also was associated with the presence of in utero complications, the occurrence of non-injurious repetitive behaviors during childhood, and endorsement of a homosexual or bisexual orientation. Self-injurers reported getting the idea to self-injure from peers (38%) more often than any other source, and most (78%) reported at least one reason for wanting to stop self-injury. Less than half were currently receiving treatment. This exploratory study provides new information about the correlates of NSSI that has implications for research and clinical work in this area.

Keywords correlates, onset, self-harm, self-injury, self-mutilation, treatment

Non-suicidal self-injury (NSSI), which refers to direct, deliberate destruction of one's body tissue without suicidal intent, has been reported to occur among 14–21% of adolescents in community samples (Jacobson & Gould, 2007; Ross & Heath, 2002; Whitlock, Eckenrode, & Silverman, 2006; Zorglu, Tuzun, Sar et al., 2006). Despite the alarmingly high rate of NSSI, fundamental aspects of this behavior remain unknown. For instance, recent research has outlined intrapersonal factors (e.g., emotion regulation) and interpersonal factors

(e.g., help seeking) that maintain NSSI once initiated (e.g., Brown, Comtois, & Linehan, 2002; Nock & Prinstein, 2004, 2005), and also has identified diagnostic correlates of this behavior (e.g., Darche, 1990; Favazza, 1998; Guertin, Lloyd-Richardson, Spirito et al., 2001; Nock, Joiner, Gordon et al., 2006) as well as personality and familial correlates (e.g., Glassman, Weierich, Hooley, et al., 2007; Najmi, Wegner, & Nock, 2007; Wedig & Nock, 2007). However, many other factors that might influence the initial onset of NSSI have been largely unexplored.

The primary goal of the current study was to conduct an exploratory examination of several as yet untested factors hypothesized to correlate with NSSI. Prior research has highlighted the important contributions that can be made using exploratory studies, such as the provision of evidence for novel research directions and the generation of testable hypotheses in these new areas (e.g., Essex, Kraemer, Armstrong et al., 2006). In this exploratory study of NSSI, we examined a range of familial (e.g., family history of self-injury and psychopathology), developmental (e.g., *in utero* and birth complications, developmental abnormalities), and social (e.g., peer influences, sexual orientation) factors hypothesized to be associated with NSSI. Below we briefly review the specific constructs examined and the rationale for focusing on each domain along with theoretically derived hypotheses in each area.

Family History and NSSI

Aspects of one's family history may be associated with, or predictive of, engagement in NSSI. Although the influence of family history on NSSI has not been examined previously, there is voluminous research on the impact of familial factors on the occurrence of psychopathology more generally. Closer to the phenomena of interest here, prior work has highlighted the important relation between a family history of suicide and suicidal behavior and subsequent suicidal behavior among offspring of the same family (e.g., Brent & Mann, 2005; Brent, Oquendo, Birmaher et al., 2002; Jobes & Schneidman, 2006). It is not clear whether the likelihood of engaging in suicidal behavior is transmitted via a genetic mechanism, through a social learning mechanism, or both. However, recent work in this area suggests that the familial transmission of diagnoses and behaviors related to suicide, such as impulsive/aggressive traits, may be helpful in explaining how family history may

influence subsequent suicidal behaviors (e.g., Mann, Bortinger, Oquendo et al., 2005; Pfeffer, Normandin, & Kakuma, 1994). Building on this earlier work we examined the relation between family history of self-injury, suicidal behavior, and psychiatric disorders and engagement in NSSI. Consistent with prior work on suicide, we expected the presence of NSSI to be associated with a family history of self-injurious behavior (both suicidal and non-suicidal in nature) and with diagnoses associated with impulsive/aggressive traits.

Developmental History and NSSI

Aspects of one's developmental history also may be associated with, or predictive of, engagement in NSSI. For instance, recent research has demonstrated that a wide range of prenatal and perinatal factors can influence the development of child and adolescent psychopathology (e.g., Allen, Lewinsohn, & Seely, 1998; Favaro, Tenconi, & Santonastaso, 2006; Gilbert, Montrose, Sahni et al., 2003; Wichers, Purcell, Danckaerts et al., 2002). The range of factors shown to associate with subsequent psychopathology are diverse and the pathways to psychopathology are largely unknown, and likely varied depending on the factors involved; however, this growing area of research may point toward key developmental processes that may ultimately prove useful in the prevention of child and adolescent behavior problems. Given the lack of work on prenatal and perinatal complications and self-injury, we did not formulate specific hypotheses but instead tested whether a significant relation exists between a range of pregnancy and birth-related complications and NSSI.

A distinct but related research area examines infant and child development and the development of psychopathology and behavior problems. For instance, problems with psychomotor development in infants and young children have been

linked to subsequent psychopathology and behavior problems (e.g., de Raeymacker, 2006; Laucht, Esser, & Schmidt, 2001). Earlier work on NSSI among children with developmental disabilities points toward some specific abnormalities in motor development that are related to engagement in NSSI. Specifically, non-injurious repetitive behavior (RB) has been shown to often co-occur with self-injurious behavior in people with intellectual disabilities (Bodfish, Symons, Parker et al., 2000; Symons, Sperry, Dropik et al., 2005). Because of this, a logical future direction would be to examine this relationship in a population without intellectual disabilities. Therefore, we hypothesized that presence of RBs would be found to be higher in the NSSI group than control group.

Social History and NSSI

Aspects of one's social history also may be associated with engagement in NSSI. The most obvious manner in which social factors may influence engagement in NSSI is regarding where individuals get the idea to engage in NSSI in the first place. This is a question that is often asked by parents and families in our clinical experience, but not one yet addressed in the research literature. Research has focused on external social influences in particular of self-destructive behaviors. For instance, suicidal behaviors in adolescents were shown to be related to suicidal behaviors of their peers and negatively associated with prosocial behaviors (Prinstein, Boergers, & Spirito, 2001). In addition to peer influence, research has shown suicide contagion, especially in adolescents, can be influenced by media coverage (Gould, 2001). While studies have examined social influences of suicidal behaviors, few studies have examined such social influences on NSSI (Walsh & Rosen, 1985). Other social factors that may influence engagement in NSSI stem from how one fits in with and

relates to one's peers. Prior work has suggested that being of a non-heterosexual orientation (i.e., being homosexual or bisexual) is associated with increased rates of psychopathology and suicidal behaviors (e.g., Fergusson, Horwood, & Beautrais, 1999). Moreover, higher rates of homosexual and bisexual orientations are found in a population that engages in NSSI compared to controls (Whitlock, Eckenrode, & Silverman, 2006). We extend this earlier work by examining the relation between non-heterosexual orientation and NSSI among adolescents.

Although we attempted to cover a lot of theoretical ground in selecting the constructs examined, this study, like most, was guided by our own ideas about what constructs we thought would be most important. In order to gain a broader perspective on the factors that might influence the onset and offset of NSSI, a secondary goal of this study was to obtain qualitative information from self-injurious adolescents themselves regarding their reasons for starting and stopping NSSI. To begin to understand this latter and as yet unexplored aspect of NSSI, we assessed adolescents' self-reported reasons for wanting to stop engaging in NSSI and also examined what percentage of adolescent self-injurers are currently in treatment.

METHOD

Participants

Ninety-four (73 female) adolescents aged 12–19 years ($M = 17.14$, $SD = 1.88$) participated in this study. The 94 adolescents providing data for this study self-reported ethnicity as: 73.4% European American, 10.6% biracial, 6.4% Hispanic, 5.3% Asian American, 3.2% African American, and 1.1% "other" ethnicity. Participants in the NSSI and control group were matched on ethnicity, gender, and

age. No significant differences in ethnicity ($\chi^2_5 = 3.30$, *ns*), gender ($\chi^2_1 = 0.48$, *ns*), or age ($t_{92} = 1.66$, *ns*) were found between the NSSI and control group. All participants provided written informed consent if over 18 years of age or written informed assent and parental consent if under 18 years of age.

Procedure

Adolescents were recruited from the community and local outpatient mental health clinics using advertisements requesting participants for a laboratory-based study of self-injurious behavior that includes people who do and do not engage in NSSI. After a telephone screen, participants were invited to the laboratory in Cambridge, Massachusetts and provided written informed consent to participate, with parental consent and participant assent required for those younger than 18 years. Comprehensive interviews and questionnaires were used to obtain data. All study procedures were approved by the Harvard University Human Subjects Committee and all participants received \$100 for their participation in this study.

Measures

Family History. In order to examine a wide range of personal and family history factors, we developed a Personal and Family History Questionnaire (PFHQ) that includes questions about family psychiatric history for the purpose of this study. We asked parents if any of the following psychiatric problems occurred in the child's family: alcohol abuse, drug abuse, depression, anxiety, bipolar disorder, schizophrenia/psychosis, Tourette's syndrome, violence, self-injury (e.g., cutting), suicide, eating disorder, mental retardation, other emotional/behavioral problems, reading problem, other learning disability, speech or language problem, and "other" psychiatric illnesses.

Developmental History. Using the PFHQ developed for this study, we assessed the adolescent's birth history by asking parents of children under 18 and participants 18 and over to list duration of pregnancy (in weeks) and labor (in hours), as well as the participant's birth weight, method of delivery (vaginal or cesarean section), problems with the delivery, the duration (in days) of the child's hospitalization after birth, if the biological mother took any medication, alcohol, drugs, during pregnancy, and if the biological mother had any illness, virus, infection, etc. during the pregnancy. In addition, the PFHQ asked "did mother experience any difficulties during pregnancy? (e.g., flu, virus, accident/injury, medical/emotional problems, prescriptions, alcohol/drug use)" and asked for a description of the problem. Also, using the PFHQ, we asked parents to provide information about the child's medical history by asking to check any boxes next to illnesses the child had and then give details below. The childhood illnesses assessed were: allergies, asthma, operations, bad reactions to medicine, high fevers, major illness, chronic ear infections, hospitalizations, if the child was ever knocked unconscious, seizures, serious accidents, head injuries, using hearing aids, and any other medical illnesses as well as if the participant wears glasses. We assessed a history of repetitive behaviors (RBs) with PFHQ by asking "Does your child have any history of repetitive or habitual behavior at any time? (such as rocking, waving, nail biting, skin picking, or scratching)?" We did not include NSSI in the category of RBs.

Social History. As an addition to the Kiddie Schedule for Affective Disorders and Schizophrenia for School Aged Children (K-SADS; Kaufman, Birmaher, Brent et al., 1997), we asked all participants "How would you describe your sexual orientation?" and gave the choices of

“(a) heterosexual, (b) homosexual, (c) bisexual, and (d) other.” For the purposes of this study, we used the dichotomous categories of heterosexual and non-heterosexual, a group including homosexual, bisexual, and other sexual orientations.

Onset and Offset of NSSI. Participants were administered the Self-Injurious Thoughts and Behaviors Interview (SITBI; Nock, Holmberg, Photos et al., 2007), a clinician-administered interview that assesses the presence, frequency, severity, age-of-onset, and other characteristics of a broad range of self-injurious thoughts and behaviors (SITB) including NSSI, suicidal ideation, suicide plans, suicide gestures, and suicide attempts. In the current study, items were used that inquired about the presence of engagement in NSSI (“Have you ever done something to hurt yourself without intending to die?”) and the frequency of this behavior, with an upper limit imposed at 500 episodes in the current study to reduce the influence of extreme outliers. Work on the SITBI (Nock, Holmberg, Photos et al., 2007) has revealed that the measure has strong inter-rater reliability (average $\kappa = 0.99$, $r = 1.0$) and test–retest reliability over a 6-month period (average $\kappa = 0.70$, ICC = 0.44). Construct validity was demonstrated via strong correspondence between the SITBI and other measures of NSSI (average $\kappa = 0.87$) from the Schedule for Affective Disorders and Schizophrenia for School Aged Children—Present and Lifetime Version (Kaufman, Birmaher, Brent et al., 1997), the Beck Scale for Suicide Ideation (SSI; Beck, Steer, & Ranieri, 1988), and the Functional Assessment of Self-Mutilation (FASM; Lloyd, Kelley, & Hope, 1997).

Onset Idea. During the initial interview, we asked all adolescents who engaged in self-injury an open-ended question from the FASM regarding the source of the idea

to engage in self-injury at onset. Specifically, we asked “How did you first get the idea of harming yourself in this way (purposefully hurting yourself without intent to die)?” After an open-ended answer was given, responses were coded into these categories: the media, peers, and without external influence. In addition, some participants reported not knowing from where the idea was conceived, which we labeled the “do not know” category. All of the answers were coded by a rater who received training in coding these responses. The coder was blind to answers previously coded by the authors. Inter-rater reliability for coding the responses into the media ($\kappa = .80$), peers ($\kappa = .86$), themselves ($\kappa = .86$), and do not know ($\kappa = .82$) categories were all shown to be good. Furthermore, responses falling into the category of “themselves” and “do not know” were coded in this study as internal sources of the idea to engage in NSSI while responses falling into the “media” and “peers” categories were coded as external sources.

Offset Reason. During the initial interview, we asked all adolescents who engaged in self-injury an open-ended question from the FASM regarding reasons for wanting to stop NSSI. Specifically, we asked “Why or why wouldn’t you like to stop (engaging in NSSI)?” Answers pertaining to reasons for wanting to stop NSSI were coded into the following categories: NSSI is unhealthy, scarring, NSSI causes shame, and NSSI upsets family or friends, as well as not being able to conceive of a reason to stop engaging in NSSI. All of the answers were coded by a rater who received training in coding these responses. The coder was blind to answers previously coded by the authors. Inter-rater reliabilities for reasons to stop engaging in NSSI [unhealthy ($\kappa = .85$), dislike of scars ($\kappa = .76$), shame ($\kappa = .79$), to please family or friends

($\kappa = .79$), stopping unwanted attention ($\kappa = .81$) and not wanting to stop categories ($\kappa = 1.00$) were all shown to be good. Furthermore, stating that NSSI is unhealthy as a reason for wanting to stop was coded as being an internally motivated reason, while all other reasons were coded as being externally motivated.

Treatment. Using the PFHQ developed for this study, we also asked parents to report if the child is currently in psychological treatment or has ever been in the past. Please note that participants 18 years and older completed this questionnaire instead of a parent ($n = 55$). In particular, the questionnaire asked “Has your child ever received psychotherapy?” and “Is your child currently receiving psychotherapy?” In addition, we asked for information on any current medications the child is currently taking or has taken. Specifically, the questionnaire asked “Has your child ever received medication?” and “Is your child currently receiving medication?” For the purposes of this study, we included information pertaining only to psychiatric medication.

Data Analysis

Data were missing at random for 10–16% participants for most analyses. Because the majority of analyses involved nominal data, only the data provided was used and no values were imputed. Sample size and degrees of freedom will vary slightly between analyses for this reason. The sample provided adequate statistical power to detect medium (power = .86) and large (power = .99) effect sizes, but insufficient power to detect small effect sizes (power = .16), using two-tailed tests with alpha set at .05. Descriptive statistics, including chi-square, are reported for the majority of study variables. All tests were two-tailed with alpha set at .05.

RESULTS

Family History and NSSI

Analyses revealed differences in family psychiatric history between self-injurers and non-injurers. Specifically, self-injurers were significantly more likely than non-injurers to have a family history of alcoholism, drug abuse, violence, and suicidal ideation; however, no difference was observed for family history of anxiety, depression, bipolar disorder, or other psychiatric problems examined (see Table 1).

Developmental History and NSSI

Examination of the relation between the presence of birth complications and NSSI revealed that 25.0% of people who engage in NSSI had *in utero* complications while this was found in only 6.7% of controls (odds ratio [OR] = 4.67, 95% Confidence Interval [CI] = 0.97–22.57, $\chi^2_1 = 4.21$, $p < .05$). Possibly related to this finding, analyses also revealed that 29.4% of people who engage in NSSI were delivered by cesarean section rather than vaginally while only 10.3% of controls were delivered by C-section (OR = 3.61, 95% CI = 0.95–13.77, $\chi^2_1 = 3.84$, $p = .05$). No significant differences were found between the NSSI and control groups for birth weight, duration of pregnancy, duration of delivery, number of miscarriages the mother has had, problems with being delivered, or problems following the delivery. Additionally, no differences in the specific medical conditions we examined were found between the control and NSSI group (results available upon request).

Examination of the relation between presence of a prior history of non-self-injurious repetitive behaviors during childhood and NSSI revealed a significantly higher rate of such behaviors among those engaging in NSSI (50.0%) compared to non-injurers (10.0%; OR = 9.00, 95%

TABLE 1. Family History of Psychiatric Illness

| Variable | NSSI (<i>n</i> = 64) (%) | Control (<i>n</i> = 30) (%) | OR | 95% Confidence intervals | | Statistic |
|---------------------------------|---------------------------------|------------------------------------|----------|-----------------------------|----------|------------------------|
| | | | | Lower | Upper | |
| Psychiatric illness | | | | | | |
| Alcohol abuse | 50.0 | 20.0 | 4.00 | 1.41 | 1.34 | $\chi^2_1 = 7.28^{**}$ |
| Drug abuse | 20.4 | 3.3 | 7.42 | 0.91 | 60.62 | $\chi^2_1 = 4.57^*$ |
| Violence | 18.5 | 0.0 | <i>a</i> | <i>a</i> | <i>a</i> | $\chi^2_1 = 6.31^*$ |
| Suicide ideation | 13.0 | 0.0 | <i>a</i> | <i>a</i> | <i>a</i> | $\chi^2_1 = 4.42^*$ |
| Self-injury | 11.1 | 3.3 | 3.63 | 0.42 | 31.64 | $\chi^2_1 = 1.53$ |
| Emotional or behavioral problem | 9.3 | 3.3 | 2.96 | 0.33 | 6.59 | $\chi^2_1 = 1.02$ |
| Bipolar | 25.9 | 10.0 | 3.15 | 0.87 | 2.02 | $\chi^2_1 = 3.03$ |
| Depression | 63.0 | 46.7 | 1.94 | 0.79 | 4.80 | $\chi^2_1 = 2.10$ |
| Anxiety | 44.4 | 36.7 | 1.38 | 0.55 | 3.45 | $\chi^2_1 = .48$ |
| Schizophrenia | 3.7 | 0.0 | <i>a</i> | <i>a</i> | <i>a</i> | $\chi^2_1 = 1.14$ |
| Tourette's | 1.9 | 0.0 | <i>a</i> | <i>a</i> | <i>a</i> | $\chi^2_1 = .56$ |
| Eating disorder | 14.8 | 10.0 | 1.57 | 0.38 | 6.41 | $\chi^2_1 = .39$ |

Family members with cerebral palsy and muscular dystrophy were inquired about, but no participants had family members with these medical issue; NSSI = Non-suicidal self-injury; OR = Odds ratio; * $p < .05$; ** $p < .01$; ^aOR not calculated due to lack of cases.

CI = 2.43–33.38, $\chi^2_1 = 13.32$, $p < .001$). History of repetitive behaviors during childhood was also associated with a higher frequency of NSSI. Specifically, of those with a lifetime history of NSSI, those who engaged in repetitive behaviors as children engaged in NSSI at a rate 2.94 times more ($M = 205.00$, $SD = 197.36$) than those without such a history ($M = 69.77$, $SD = 131.91$; $t(43.62) = 2.91$, $p < .01$, $d = .81$).

Social History and NSSI

Analyses also revealed significant differences in sexual orientation between the NSSI and control groups. More specifically, 32.6% of participants in the NSSI group reported a non-heterosexual orientation compared with only 11.11% of participants in the control group, OR = 3.81, 95% CI = 1.03–14.16, $\chi^2_1 = 4.39$, $p < .05$.

Onset of NSSI

As an initial step toward determining potential pathways of the onset of NSSI, adolescents were asked to self-report the source of the idea to engage in NSSI at onset. Specifically, 38.3% reported they first got the idea to engage in NSSI from their peers, while 13.3% reported that the idea came from the media. The remaining participants reported either that they generated the idea to engage in NSSI on their own (20.0%) or that they are unable to recall from where the idea was conceived (28.3%).

Offset of NSSI

When asked whether there were reasons to stop engaging in NSSI, most (78.8%) adolescents with a history of NSSI were able to report a reason to stop this behavior. As presented in Table 2, the

TABLE 2. Reasons to Stop Engaging in NSSI

| | NSSI (%) |
|--|----------|
| Do you want to stop NSSI? | |
| Reported a reason to stop | 78.8 |
| Did not report a reason to stop | 21.2 |
| Why do you want to stop NSSI? | |
| Internal reason to stop engaging in NSSI | |
| NSSI is an unhealthy behavior | 56.1 |
| External reason to stop engaging in NSSI | |
| NSSI attracts unwanted attention | 17.1 |
| Scarring | 14.6 |
| NSSI causes shame | 7.3 |
| NSSI upsets family and friends | 4.9 |

n = 52. NSSI = Non-suicidal self-injury.

primary reason that adolescents reported wanting to stop engaging in NSSI was that it is an unhealthy behavior. Adolescents also reported several socially oriented reasons for wanting to stop this behavior. Those who reported conceiving of the idea to engage in NSSI via social sources were more likely to report wanting to stop for social reasons (OR = 6.10, 95% CI = 1.49–25.00, $\chi^2_1 = 6.81, p < .01$).

Treatment

Rates of lifetime and current psychological and psychopharmacological treatment are presented in Table 3 separately

TABLE 3. Treatment

| Variable | NSSI (%) | Control (%) | Statistic |
|---------------------|----------|-------------|-------------------------|
| Lifetime treatment | | | |
| Psychological | 78.2 | 27.3 | $\chi^2_1 = 24.71^{**}$ |
| Psychopharmacologic | 64.2 | 17.7 | $\chi^2_1 = 15.73^{**}$ |
| Current Treatment | | | |
| Psychological | 48.2 | 10.7 | $\chi^2_1 = 11.43^*$ |
| Psychopharmacologic | 45.3 | 3.5 | $\chi^2_1 = 14.94^{**}$ |

n = 53 for the NSSI group and *n* = 28 for the control group; NSSI = Non-suicidal self-injury; **p* < .01; ***p* < .001.

for self-injurers and non-injurers. Self-injurers were significantly more likely to receive psychological and pharmacological treatment than non-injurers in their lifetime and currently. Interestingly, however, less than half of adolescents with a history of NSSI were currently in each form of treatment. Since it is possible that many people in the lifetime NSSI group were not currently in treatment because they no longer engage in NSSI, we also examined what percentage of people who reported recently engaging in NSSI (i.e., within the past month) and found similarly that only 43.2% were receiving psychosocial treatment and only 45.7% were receiving pharmacotherapy.

DISCUSSION

Recent studies of NSSI have focused largely on the diagnostic and clinical correlates of these behaviors. Missing from prior studies is information about the broader range of factors that may be associated with NSSI and that could potentially point toward new directions in research in this area. In an attempt to address this knowledge gap, this exploratory study examined familial, developmental and social factors hypothesized to correlate with engagement in NSSI, as well as qualitative data on adolescents' reported sources of the idea to engage in NSSI, as well as

their reasons for wanting to stop engaging in NSSI. Finally, we reported on psychological and psychopharmacological treatment utilization in both the NSSI and control groups. Analyses revealed important information in each domain examined. Some of the key findings are discussed in greater detail below.

Our hypothesis that family history of self-injurious thoughts and behaviors as well as impulsive/aggressive traits would occur more often in the NSSI group was supported. Specifically, higher rates of suicidality, violence, and alcohol/drug abuse were found in family members of those who engage in NSSI, while there was no difference in family history of mood disorders, schizophrenia, Tourette's syndrome, anxiety disorders, or eating disorders. Although self-injurers had a greater family history of NSSI than non-injurers, this difference was not statistically significant. Notably, people in the NSSI group tended to have family members with more impulsiveness related psychiatric disorders than controls. Family history of psychiatric illness may contribute to onset of NSSI in two important ways. First, an environment in which authority figures display lack of impulse control could serve as a model for children, thereby fostering NSSI. Researching methods through which the modeling of one impulsive behavior may lead to social spreading of other types of impulsive behaviors such as NSSI may be an interesting starting point. Second, a biological component of proneness to general lack of impulse control may add to the likeliness of NSSI onset. Studying the role of neurotransmitters such as serotonin (e.g., Crowell, Beauchaine et al., 2005) as well as the function and development of brain structures such as the orbitofrontal cortex, dorsolateral prefrontal cortex, and anterior cingulate cortex, which have been shown to be related to impulsiveness (Kertzman, Grinspan, Birger et al., 2006), in people who engage in NSSI and their

family members may serve as a starting point. In addition, dysfunction in the reward system has been shown to be linked to several impulsive behaviors (Blum, Braverman, Holder et al., 2000). Studying the dysfunction of this system in families with members who engage in impulsive behaviors including NSSI may also prove to be a promising direction for future research.

In addition to examining family psychiatric history, we examined developmental correlates of NSSI. Although our hypothesis that birth complications would be related to NSSI was not supported, more people in the NSSI group compared to the control group did experience *in utero* complications. The possibility exists that *in utero* complications interfere with development contributing to the onset of NSSI. In addition to *in utero* complications, more adolescents who engage in NSSI were delivered by cesarean section than controls. This finding might be related to an elevation of *in utero* complications. Perhaps the cause of the *in utero* complications or the complications themselves could have caused proneness to engagement in NSSI. An alternative hypothesis that is important to consider is that some third variable, such as parental illness or stress, contributes directly to both birth complications and adolescent NSSI. This is an intriguing and exciting area for future research on NSSI.

Interestingly, our hypothesis that more people in the NSSI group would engage in repetitive behaviors as children was supported by the data. More specifically, in this study 50.0% of participants in the NSSI group also engaged in repetitive behaviors as children while only 10.0% of controls engaged in repetitive behaviors. In addition, within the NSSI group, people who engaged in repetitive behaviors as children engaged in NSSI 2.94 times more over their lifetime than people in the NSSI group that did not engage in repetitive behaviors. The results of our study

combined with findings from prior reports (Symons, Sperry, Dropik et al., 2005) suggest that repetitive behaviors may be a precursor to NSSI, although it is important to note that such behaviors were assessed retrospectively in the current study and so current adolescent NSSI may have influenced parents' recollections of repetitive behaviors. Longitudinal studies are needed to further examine the relation between repetitive behaviors and NSSI, and if evidence for such a link is found this can have important implications for early intervention efforts.

Prior research suggests that a non-heterosexual orientation is related to engagement in NSSI (Whitlock, Eckenrode, & Silverman, 2006) and this finding was replicated in the current study. However we only examined the dichotomous grouping of heterosexual or not heterosexual and failed to examine differences in bisexual orientations due to sample size. The differences in sexual orientation between the NSSI and control group could have both social and biological origins. Perhaps the social stress that people with a non-heterosexual orientation experience is a contributing factor to onset of NSSI. In addition, as prenatal sex hormones have been shown to affect sexual orientation (Rahman, 2005), the possibility exists that this may play a specific role in onset of NSSI. Future studies should examine not only the particular environmental stressors in the daily life of people with a non-heterosexual orientation in particular, but the specific role hormones play in the onset of NSSI.

We examined a broad range of domains that have not been tested in relation to NSSI in prior studies. However, many of these factors (e.g., family history of psychopathology, birth complications, non-heterosexual orientation) have been linked to the presence of adolescent psychopathology, which has itself been linked to the presence of NSSI (e.g., Nock, Joiner, Gordon et al., 2006). This raises the

question of whether any of these factors are uniquely or specifically related to NSSI, or are associated via their more general relation with psychopathology. The exploratory nature of this study and the relatively small sample size used precluded us from testing more complex multivariate models to tease apart these relations; however, and so this remains a very important question for future research. It is notable, however, that several findings from this study would appear to show some specificity to NSSI. For instance, the finding that parent psychopathology involving violence, alcohol/substance use, and suicidal ideation is related to NSSI, but other forms of psychopathology (e.g., depression, anxiety) are not related is intriguing. Also, the presence of repetitive behaviors prior to (by retrospective report) engagement in NSSI suggests homotypic continuity, or consistency in the form of the behavior problem, over time.

Another way to attempt to understand why people may engage in NSSI in particular is to ask for their understanding of why they have done so. This study revealed that adolescents reported most often getting the idea to engage in NSSI from peers and the media. The fact that approximately half of the sample reported getting the idea to engage in NSSI from external sources such as peers and the media suggests a strong social modeling component of this behavior. Although findings suggest that a modeling component may be a pathway to the onset of NSSI for some adolescents, these data also suggest that NSSI may develop via an intrapersonal pathway for some people. While the system we developed for coding responses into friends, media, unknown, or personally conceived has good inter-rater reliability, self-reporting biases might be particularly prevalent in reporting the sources of the idea to engage in NSSI. For example, although subjects might have reported personally conceiving the idea, perhaps early

exposure to NSSI through peers or the media played a role in the participant's onset of NSSI; however, the participant cannot recall the exposure. The possibility also exists that one could wrongfully attribute onset of NSSI to external exposure through peers or the media in an attempt to explain the behavior.

Along with examining reported source of the idea to first engage in NSSI, we examined reported reasons for wanting to stop engaging in NSSI. Most self-injurious adolescents were able to generate reasons for wanting to stop engaging in NSSI, and their reasons for stopping most often centered around NSSI being an unhealthy behavior, with smaller percentages indicating that they wanted to stop because of unwanted attention from others, to prevent scarring, because of shame caused from engaging in NSSI, and because their NSSI upset family and friends. Additionally, those who reported getting the idea from peers also reported wishing to stop for external reasons and those who reported internal sources of the idea reported wishing to stop for internal reasons. Perhaps with more information from research on how people conceive the idea to engage in NSSI at onset and what factors are correlated with offset, components of prevention or intervention programs for those who engage in NSSI could become more tailored for individual clients, as has been done for suicidal individuals (e.g., Rudd, Joiner, & Rajab, 2001).

Finally, we examined rates of psychological and psychopharmacological treatment utilization between the NSSI and control groups. Our hypothesis that the amount of people in the NSSI group in psychological and pharmacological treatment would be higher than the amount of people in the control group was supported. Although participants in the NSSI received more treatment than controls, we found that less than half of self-injurious adolescents are currently in any type of

psychological treatment and less than half are in psychopharmacological treatment. Furthermore, less than half of people who engaged in NSSI in the past month were currently receiving psychological or psychopharmacological therapy. This may be the case for various reasons such as lack resources or concern about the behavior. Future research is needed to understand why people who engage in NSSI are not in treatment and clinical efforts are needed to help treat this behavior.

Several key limitations must be borne in mind when interpreting the results of this study. First, this study included a relatively small sample of adolescents and parents from a northeastern urban population who agreed to participate in a laboratory-based study of NSSI, limiting the generality of the results. Second, data were obtained through retrospective self-report, a method with well-known limitations such as biased recall and forgetting. Third, the majority of the results in this study are based on self-report answers to one question rather than an entire previously validated measure of these constructs. Although this may provide for obtaining answers in a direction manner, reliability is limited. Finally, the variables used for this paper were collected for a study that was not designed to primarily examine correlates of NSSI as well as variables related to onset and offset of this behavior. In addition, we had different amounts of data missing for each analysis. Due to these factors, power was limited to detect only medium and large effect sizes in most cases and only large effect sizes in a few cases.

These limitations notwithstanding, this study provides important preliminary findings on family, developmental, and social correlates of NSSI as well as information on onset and offset of NSSI. Risk factors as well as pathways to onset and offset of NSSI must be discovered to help better prevent and treat self-injurious behavior. Toward this end, research on the correlates

of onset and offset of NSSI will contribute to understanding of the nature and course of this maladaptive behavior. In addition, gathering information regarding the number of people who engage in NSSI and receive treatment is important in demonstrating the need for prevention and widely implemented treatment programs.

AUTHOR NOTE

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