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The Epidemiology and Phenomenology of Non-Suicidal Self-Injurious Behavior Among Adolescents: A Critical Review of the Literature

Colleen M. Jacobson and Madelyn Gould

This article critically reviewed the research addressing the epidemiology and phenomenology of non-suicidal self-injury (NSSI) among adolescents. Articles were identified through a search of Medline and Psychinfo. Findings indicate a lifetime prevalence of NSSI ranging from 13.0% to 23.2%. Reasons for engaging in NSSI include to regulate emotion and to elicit attention. Correlates of NSSI include a history of sexual abuse, depression, anxiety, alexithymia, hostility, smoking, dissociation, suicidal ideation, and suicidal behaviors. Suggested areas of future research include identifying the psychiatric diagnoses associated with NSSI among adolescents, determining the temporal link between NSSI and suicide attempts, learning more about the course of NSSI, understanding the biological underpinnings of NSSI, and identifying effective treatments for NSSI in adolescents.

Keywords adolescence, depression, review, self-injurious behavior, suicide

Suicidal and self-injurious behaviors affect millions of teenagers each year indicating a public health problem in need of attention and intervention. As the third leading cause of death, suicide took the lives of approximately 4000 young people (15–24 year olds) in 2002 (Kochanek, Murphy, Anderson et al., 2004). In addition, 8.4% of high school students reported engaging in a suicide attempt in 2005 (CDC, 2006). The rate of engagement in non-suicidal self-injury (NSSI), i.e., purposefully hurting oneself without the conscious intent to die (Favazza, 1998) such as self-cutting or

burning, among children and adolescents is less clear due to the absence of assessments of NSSI in most large, epidemiological studies. However, initial research findings suggest that engagement in (NSSI) is on the rise among adolescents (Garrison et al., 1993; Muehlenkamp & Gutierrez, 2004; Olfson, Gameroff, Marcus et al., 2005). Research has identified high rates of suicide attempts among people who engage in NSSI (Jacobson, Muehlenkamp, & Miller, under review; Lipschitz, Winegar, Nicolaou et al., 1999; Nock, Joiner, Gordon et al., 2006) which therefore leaves people

who engage in NSSI at increased risk for completing suicide (Angst, Stassen, Clayton et al., 2001). Due to the increased awareness of the community at large about self-injurious behaviors among teenagers, research investigating the epidemiology, phenomenology and treatments for NSSI is also increasing. However, as will be made clear in this review, there remains a considerable amount of work to be done.

There are no existing comprehensive, critical reviews of the research base that has addressed NSSI among adolescents. The lack of existing reviews is very likely due to a lack of clarity in the field and failure of research studies to differentiate between suicide attempts and NSSI. This paper has three goals: 1) to provide education about the phenomenology and risk factors for NSSI to clinicians working with adolescents, 2) to provide a critical review of the empirical research addressing NSSI in adolescents with a focus on how NSSI differs from suicide attempts, and 3) to highlight the areas most in need of further investigation. A brief history of the classification of self-injurious behaviors will be presented prior to the review of the epidemiology and phenomenology of NSSI.

Classification of Self-Injurious Behaviors

The field of suicidology (including the study of non-suicidal behaviors) has been plagued by inconsistent terminology. Researchers and clinicians have struggled with which terms will provide the most clarity and sensitivity to suicide-related thoughts and behaviors. Further, many research studies have failed to separate acts of non-suicidal self-injury and suicidal behaviors, i.e., behaviors engaged in with the intent to die as a result of the act (e.g., Hawton, Rodham, Evens et al., 2002; Hawton, Sumkin, Bale et al., 2004; Hurry, 2000). However, the majority of clinicians and researchers are now in agreement that there is a distinct type of beha-

avior (NSSI) engaged in for reasons other than to end one's life, and have argued that it should be differentiated from behaviors that are suicidal in nature (Muehlenkamp, 2005; Nock & Kessler, 2006).

Theoretical arguments, grounded in empirical research mainly involving adults, to differentiate between the two behaviors, NSSI and suicidal behavior, are articulated elsewhere (see Muehlenkamp, 2005 and Walsh, 2005). To briefly summarize, an argument is made that NSSI and suicide differ with respect to intent, lethality, chronicity, methods, cognitions, reactions, aftermath, demographics, and prevalence (Muehlenkamp, 2005; Walsh, 2005). First, the obvious difference between NSSI and suicide attempts is the intent of behavior: suicide attempts are engaged in to kill oneself, NSSI is not. As Walsh (2005) articulated, "the intent of the self-injuring person is not to *terminate* consciousness (as in suicide) but to *modify* it" (pg. 7). Both authors also argue that NSSI is more common than completed suicide and attempts and that NSSI is equivalent among boys and girls and more common in adolescents while completed suicide is more common in adult males. Additionally, Muehlenkamp and Walsh state that NSSI is engaged in more frequently (within the individual) and with various methods compared to suicide attempts. Further, they suggest that the cognitions involved in the two behaviors are distinct: those who engage in NSSI typically have thoughts of temporary relief, while those who engage in suicidal behaviors have thoughts of permanent relief through death. Muehlenkamp's and Walsh's arguments are informative and provocative. However, the conclusions they reached were based on a relatively small number of research studies of varying degrees of scientific rigor most of which were conducted with adults. The present paper will critically review the research among adolescents thus serving to further inform the differentiation debate. The

implications of failing to separate behaviors that are distinct in intent, function, and epidemiology are far reaching as they directly relate to prevention and treatment efforts for both NSSI and suicide attempts.

Despite the recognition of the need to study NSSI, problems persist due to the use of different terms to refer to NSSI in the literature. When perusing the literature, a reader will encounter several terms including self-injurious behavior, non-suicidal self-injury, self-mutilation, cutting, deliberate self-harm, delicate self-cutting, self-inflicted violence, parasuicide, and autoaggression. However, many of these terms encompass more than NSSI. The term deliberate self-harm is used by researchers in the US to refer to NSSI (see Gratz, 2001; Gratz, Conrad, & Roemer, 2002) while researchers in the UK use the term to refer to any purposeful, nonlethal self-injurious act engaged in with or without suicidal intent (see Hawton, Rodham, Evans et al., 2002; Hawton, Harriss, Sumkin et al., 2004). In addition, the term parasuicide as used by Linehan (1993) encompasses suicide attempts and NSSI. Self-injurious behavior may also refer to the stereotypic, habitual behaviors sometimes engaged in without control, by people with pervasive developmental disorders, or the severe types of self-mutilation carried out by people experiencing psychotic symptoms, typically command hallucinations.

The term non-suicidal self-injury (NSSI) will be used throughout this review to refer to behaviors engaged in with the purposeful intention of hurting oneself without intentionally trying to kill oneself. Note that this definition/term does not make assumptions about the intended motive behind the behavior other than a lack of suicidal intent. This term, NSSI, was chosen for two reasons: 1) for its lack of pejorative connotation and 2) the term itself distinguishes these behaviors from suicide attempts. Using this definition of

NSSI, this paper will critically summarize research addressing the epidemiology and phenomenology of NSSI among adolescents, a step necessary to inform the debate as to whether NSSI should be distinguished from behaviors with suicide intent.

METHOD

In order for the current paper to add significantly to the literature, it is narrowly focused, including only empirical research addressing NSSI among children and adolescents. Papers that did not distinguish between NSSI and suicide attempts were excluded from this review. Only articles focusing on children and adolescents were included, except in certain circumstances. Papers addressing adult samples were included if 1) it was a representative, epidemiological study, 2) it addressed the longitudinal course of NSSI, or 3) it addressed biological underpinnings of NSSI. See Gratz (2003) and Suyemtoto (1998) for a review of NSSI in adults.

Articles were identified by searching Psychoinfo and Medline, in addition to perusing the reference lists of relevant articles. The search terms included: self-injurious behavior, non-suicidal self-injury, self-mutilation, and deliberate self-harm. An initial search yielded nearly 3000 articles, however, ultimately only 25 articles were appropriate for inclusion in the current review. Only those studies specifying self-injury *without suicidal intent* were included in the review. Empirical articles under review and in press were also included due to the limited number of relevant articles identified using only published materials. The main reasons for exclusion from this review were that an article addressed a different type of self-injurious behavior, such as stereotypical behavior engaged in by people who are developmentally delayed, it failed to differentiate between suicidal

and non-suicidal behaviors, and/or it included an adult sample that was not large scale and representative. Twenty two of the final articles included adolescents, while three included college students or adults. Only large scale epidemiological and longitudinal studies of adults were reviewed in the current article.

Prevalence, Demographics, and Phenomenology

Prevalence and Demographics. In order to estimate the prevalence of a behavior, it is necessary to have a representative, non-referred, community sample. Eight studies, two of which are from adult samples, were identified that meet this requirement (Briere & Gil, 1998; Garrison, Cheryl, McKeown et al., 1993; Laye-Gindhu & Schonert-Reichl, 2005; Muehlenkamp & Gutierrez, 2004, 2007; Ross & Heath, 2003; Whitlock, Eckenrode, & Silverman, 2006; Zoroglu, Tuzun, Sar et al., 2003). Comparing prevalence rates across the studies presented below is difficult as the time frame for the assessed behavior varies. Only one of the eight studies included a large, nationally representative study of adults (Briere & Gil, 1998). This study found a six-month prevalence rate of NSSI of 4%. No gender differences were identified and 0.3% reported engaging in NSSI "often." A recent college-based survey indicated a lifetime prevalence of any NSSI of 17%, with 7.3% having engaged in NSSI within the preceding 12 months (Whitlock, Eckenrode, & Silverman, 2006); however, the participation rate for this study was extremely low, leaving the sample biased and the rates possibly inflated.

Among the studies that included only adolescents (mainly high school students) findings indicate a lifetime prevalence of NSSI ranging from 13.0% to 23.2% (Laye-Gindhu & Schonert-Reichl, 2005; Muehlenkamp & Gutierrez, 2004; Muehlenkamp & Gutierrez, 2007; Ross & Health, 2002; Zoroglu, Shea,

Pearlstein et al., 2003), with a 12-month prevalence ranging from 2.5% to 12.5% (Garrison, Cheryl, McKeown et al., 1993; Muehlenkamp & Gutierrez, 2007). See Table 1 for a summary of the main research findings of studies involving adolescent samples. It should be noted that the participation rates for three of the six studies (Muehlenkamp & Gutierrez, 2004; Muehlenkamp & Gutierrez, 2007; Ross & Health, 2002) were not reported, thus the representativeness of the samples is unknown. Additionally, the large difference in 12-month prevalence rates between the Garrison and colleagues study (2.5%) and the Muehlenkamp & Gutierrez (under review) study (12.5%) is likely due to the fact that the participants in the latter study were significantly older than those in the former. The difference may also be due to a cohort effect, as the studies were conducted approximately ten years apart in time. Indeed, the pattern of results reported in the two Muehlenkamp & Gutierrez studies of the prevalence rates *suggests* that NSSI is increasing. The lifetime prevalence rate reported in the first study was 15.9% while the lifetime rate reported in the second study, which used data from the same high school collected years later, was 23.2%. Further research, preferably of a nationally representative nature, is needed to corroborate this speculative conclusion. While providing useful information, the above reviewed studies yield prevalence rates of NSSI among adolescents who are attending school. Therefore, it is likely that the true prevalence of NSSI among adolescents is higher than that identified in these studies, as people who were truant or who had withdrawn from school were not included. Research indicates that adolescents who do not attend school have higher rates of psychopathology (Egger, Costello, & Angold, 2003).

The data are inconclusive as to whether NSSI is more common among females than males. Of the six community based studies of NSSI with adolescent participants, three (Laye-Gindhu & Schonert-Reichl, 2005; Muehlenkamp & Gutierrez,

TABLE 1. Summary of Main Research Findings from Adolescent Studies

Characteristic of interest	# of studies	Types of sample	Comment/findings	References
Prevalence	6	Non-referred	Lifetime: 13.0% to 23.2%; 12-month: 2.5% to 12.5%	Garrison et al., 1993; Laye-Gindhu & Schonert-Reichl, 2005; Muehlenkamp & Gutierrez, 2004, 2007; Ross & Heath, 2002; Zoroglu et al., 2003
Gender distribution	6	Non-referred	3 studies found more common in females, 3 found no difference	Garrison et al., 1993; Laye-Gindhu & Schonert-Reichl, 2005; Muehlenkamp & Gutierrez, 2004, 2007; Ross & Heath, 2002; Zoroglu et al., 2003
Ethnic distribution	6	Non-referred	2 studies found higher rate of NSSI in Caucasians; 1 found no differences; other 3 did not test	Garrison et al., 1993; Laye-Gindhu & Schonert-Reichl, 2005; Muehlenkamp & Gutierrez, 2004, 2007; Ross & Heath, 2002; Zoroglu et al., 2003
Age of onset	6	Non-referred & referred	12 to 14	Kumar et al., 2005; Muehlenkamp & Gutierrez, 2004, 2007; Nixon et al., 2002; Nock & Prinstein, 2004; Ross & Heath, 2003
Most common methods	5	Non-referred & referred	Cutting, self-hitting	Laye-Gindhu & Schonert-Reichl, 2005; Muehlenkamp & Gutierrez, 2004, 2007; Ross & Heath, 2003; Zoroglu et al., 2003
Reasons for behavior	6	Non-referred & referred	Emotion regulation most common, then social reinforcement	Kumar et al., 2004; Laye-Gindhu & Schonert-Reichl, 2005; Nixon et al., 2002; Nock & Prinstein, 2004, 2005; Ross & Heath, 2003
Co-morbid diagnoses	4	Non-referred & referred	Depressive disorder; features of BPD (2 studies)	Garrison et al., 1993; Jacobson et al., under review; Kumar et al., 2005; Nock, Joiner et al., 2006

(Continued)

TABLE 1. (Continued)

Characteristic of interest	# of studies	Types of sample	Comment/findings	References
Risk factors/correlates				
Abuse history	3	Referred	Sexual abuse uniquely associated with NSSI in all studies; physical abuse not as consistent	Kiesel & Lyons, 1999; Lipschitz et al., 1999; Zoroglu et al., 2003
Negative life event	1	Non-referred	Negative life events uniquely associated with NSSI	Garrison et al., 1993
Dissociation	2	Referred	Dissociation mediates relationship between sexual abuse and NSSI	Kiesel & Lyons, 1999; Zoroglu et al., 2003
Alexithymia	1	Referred	Elevated alexithymia associated with NSSI	Kiesel & Lyons, 1999
Depression	2	Non-referred & referred	Elevated depression associated with NSSI	Garrison et al., 1993; Ross & Heath, 2002
Anxiety	1	Non-referred & referred	Elevated anxiety associated with NSSI	Ross & Heath, 2002
Suicidal ideation	1	Non-referred	Suicidal ideation associated with NSSI (suicide attempt hx not controlled for)	Garrison et al., 1993
Thought suppression	1	Referred	Thought suppression associated with NSSI	Najimi et al., under review
Emotional reactivity	1	Referred	Emotional reactivity associated with NSSI	Nock et al., in press
Negative Self-esteem	1	Non-referred	Negative self-esteem associated with NSSI	Laye-Gindhu & Schonert-Reichl, 2005
Antisocial behaviors	1	Non-referred	Antisocial behaviors associated with NSSI	Laye-Gindhu & Schonert-Reichl, 2005
Anger	1	Non-referred	Anger associated with NSSI	Laye-Gindhu & Schonert-Reichl, 2005
Overlap with suicide attempts	5	Non-referred & referred	Suicide attempt rate elevated in adolescents who engage in NSSI	Garrison et al., 1993; Jacobson et al., under review; Laye-Gindhu & Schonert-Reichl, 2005; Lipschitz et al., 1999; Muehlenkamp & Gutierrez, 2007

2007; Ross & Heath, 2002) found that females were significantly more likely to have engaged in NSSI than males; the other three found no differences in the rate of NSSI between males and females (Garrison, Cheryl, McKeown et al., 1993; Muehlenkamp & Gutierrez, 2004; Zoroglu, Tuzun, Sar et al., 2003). Among the two adult studies, one identified that females were more likely than males to have engaged in repeated NSSI; no gender difference was found for single incident NSSI (Whitlock, Eckenrode, & Silverman, 2006). The Briere and Gil study (1993) did not identify gender differences. As additional research is conducted in this area, the answer to the question of gender differences will hopefully become clearer.

Whether NSSI is more common among Caucasians than of people of different ethnicities is unclear as well. Of the six community based adolescent studies, two (Muehlenkamp & Gutierrez, 2004, 2007) found the rates of NSSI to be higher among Caucasians than non-Caucasians. One study found no ethnic difference in rates of NSSI (Laye-Gindhu & Schonert-Reichl, 2005). None of the other three studies subjected the ethnic distribution to statistical tests. The university-based study found that Asian/Asian-American students were less likely than Caucasian students to have engaged in more than one incident of NSSI (Whitlock, Eckenrode, & Silverman, 2006). Again, more research is needed to clarify this relationship. Specifically, the addition of questions pertaining to NSSI in large scale epidemiological surveys would provide invaluable information regarding the prevalence of NSSI and the relationships between NSSI and gender and ethnicity. In addition, conducting large scale surveys over time would provide an answer to the question of whether NSSI is actually increasing.

Age of Onset. Each of the studies to be reviewed that report on the phenomenology

of NSSI share a common flaw in that they are all retrospective in design. The retrospective design is problematic as people's memories of specific incidences of NSSI likely dampen and change as the length of time since the behavior increases. Information regarding the average age of onset of NSSI is the most remote aspect of the behavior. Despite this shortcoming, findings are surprisingly consistent across clinical and community-based samples, indicating that the typical reported age of onset of NSSI falls between 12 and 14 years of age (Kumar, Pepe, & Steer, 2004; Muehlenkamp & Gutierrez, 2004; Muehlenkamp & Gutierrez, 2007; Nixon, Cloutier, & Aggarwai, 2002; Nock & Prinstein, 2004; Ross & Heath, 2003).

Frequency. The frequency with which people engage in NSSI varies greatly and may be related to the degree of overall impairment or psychopathology within the individual (although such a relationship has not been verified). The reliability of assessing the frequency of repetitive behaviors, such as NSSI, retrospectively is unknown. In the Muehlenkamp & Gutierrez (2007) study, 25% of those reporting NSSI reported only one incident, about 33% reported between 2–3 incidents and 20% reported more than 4 incidences. Nearly 25% of the sample did not report the frequency of their NSSI. The range of NSSI was wide in the Ross and Heath (2002) sample with 13.1% reporting daily NSSI, 27.9% biweekly NSSI, 19.6% bi-monthly NSSI, 18% one incident, and 19.6% episodic NSSI. In the Laye-Gindhu & Schonert-Reichl (2005) study, the majority of adolescents who reported NSSI reported engaging in NSSI more than one time. Fifty two percent of the self-injurers said they had engaged in NSSI between 2 and 10 times. Unfortunately, the other community based studies (Garrison, Cheryl, McKeown et al., 1993; Muehlenkamp & Gutierrez, 2004; Zoroglu,

Tuzun, Sar et al., 2003) did not report on the frequency of NSSI. Among those studies in which psychiatric patients participated, the average lifetime frequency of NSSI ranged from 7.0 among outpatients samples (Jacobson, Muehlenkamp, & Miller, under review) to 101 among inpatients (Nock, Joiner, Gordon et al., 2006). Thus, the typical frequency of NSSI among adolescents varies greatly; further research is needed to clarify the risk factors for repetitive engagement in NSSI. It is likely the combination of unique biological, physiological, and psychological characteristics that lead some adolescents to come to rely on NSSI as a coping mechanism while others try it once and have no inclination to repeat the NSSI.

Course. Regarding the within person course of NSSI, it is common belief that NSSI peaks in mid-adolescence and decreases into adulthood. However, to date, support for this belief does not exist. There are no published studies that report on the prospective course of NSSI among adolescents. Only one study has prospectively assessed the course of NSSI in adults. The McLean Study of Adult Development followed 299 participants, aged 18 to 35 years, all of whom met criteria for Borderline Personality Disorder, for several years (Zanarini, Frankenburg, Hennen et al., 2005). At baseline, 81% of the participants reported engaging in NSSI within the previous 2 years, while only 26% of the participants reported engaging in NSSI at 6-year follow-up. The findings from this study suggest that the NSSI decreases over time, at least among people with BPD. Directions for future research include assessing risk factors for continued engagement in NSSI over time.

Methods. Consistency across studies regarding the most common methods used to engage in NSSI is relatively high. Cutting oneself with a sharp object and self-hitting

were among the top three methods used to self-injure in five samples of adolescents (Laye-Gindhu & Schonert-Reichl, 2005; Muehlenkamp & Gutierrez, 2004; Muehlenkamp & Gutierrez, under review; Ross & Heath, 2003; Zoroglu, Tuzun, Sar et al., 2003). Other methods endorsed were pinching oneself, picking at a wound, interfering with wound healing, and scratching oneself. The extent to which different behaviors are reported likely varies based on the methodology used to elicit responses. For example, an interview(er) may ask the participant to tell from memory the types of behaviors s/he has engaged in, while another interview(er) (e.g., the Functional Assessment of Self-Mutilation, Lloyd, Kelley, & Hope, 1997) may cue the respondent by listing different methods and asking the respondent to endorse those they have used. There is also debate in the field as to the necessary severity of a behavior to be considered an act of NSSI. For example, it is unclear whether “picking at a scab” should be included as an act of self-injury. More research is needed to determine which types of behaviors are associated with psychopathology or impairment. It is likely that picking at a scab represents “normal” behavior that is not indicative of impairment while cutting oneself is less common and linked to some type of dysfunction or pathology.

The number of different methods used to inflict NSSI ranges based on whether the sample is from the community or the clinic. The community based samples indicate that the majority of those who self-injure use only one method (Ross & Heath, 2003; Muehlenkamp & Gutierrez, 2004). However, in a study assessing adolescents on an inpatient unit who had engaged in NSSI, the mean number of methods used was 2.5 (SD = 1.5; Kumar, Pepe, & Steer, 2004).

Consistent with the pattern that adolescents receiving formal treatment use a greater number of instruments to self-injure, findings indicate that the number

of methods used to self-injure seems to be associated with overall impairment, even more so than the frequency of self-injurious episodes (regardless of methods). For example, two independent studies found that the number of methods used to self-injure was predictive of suicide attempts status, whereas the total number of NSSI episodes was not (Nock, Joiner, Gordon et al., 2006; Zlotnick, Donaldson, Spirito et al., 1997). These findings highlight the importance of assessing not only the presence and frequency of NSSI, but also the number of different methods used to engage in NSSI.

Feelings and Experiences Associated with NSSI. There has been some research among adolescents who have engaged in NSSI addressing the contextual factors associated with self-injury (Kumar, Pepe, & Steer, 2005; Laye-Gindhu & Schonert-Reichl, 2005; Nixon, Cloutier, & Aggarwai, 2002; Nock & Prinstein, 2005; Ross & Heath, 2003). The majority of studies were conducted on inpatient units and included participants who had engaged in NSSI relatively recently (i.e., within the preceding 12 months or less; Kumar, Pepe, & Steer, 2005; Nixon, Cloutier, & Aggarwai, 2002; Nock & Prinstein, 2005). Two studies (Laye-Gindhu & Schonert-Reichl, 2005; Ross & Heath, 2003) included non-referred high school students and the length of time between NSSI and interview completion was likely longer than for the clinical samples. This research indicates that the majority of adolescents engages in NSSI impulsively, while sober, and experience little or no pain during the act (Kumar, Pepe, & Steer, 2005; Nock & Prinstein, 2005). Additionally, in one sample, the large majority (82%) of adolescents on the inpatient unit knew a friend outside of the hospital who engaged in NSSI (Nock & Prinstein, 2005).

Adolescents report experiencing several different feelings before and after engaging in NSSI. In one community sample, the

majority reported a combination of anxiety and hostility just prior to self-injuring, while fewer reported only sadness, only anxiety, or only hostility (Ross & Heath, 2003). In regards to the aftermath, research indicates that adolescents tend to feel a combination of relief and shame, guilt, and disappointment (Kumar, Pepe, & Steer, 2005; Laye-Gindhu & Schonert-Reichl, 2005; Nixon, Cloutier, & Aggarwai, 2002). This pattern highlights the complex emotional processes involved in self-injuring. While NSSI may act as an effective coping mechanism in the short-run, it likely acts to increase negative feelings about oneself, thus serving to exacerbate symptoms and distress, in the long-run.

The studies described above that have addressed the experiences of adolescents immediately before, during, and after they engage in NSSI provide crucial information that has informed treatment and prevention efforts. However, they are flawed due to their retrospective designs. Alternatives to this methodology include using ecological momentary assessment, in which the participants carry palm pilots and enter information about feeling states when they have urges to self-injure, or experimentally inducing urges to self-injure, a procedure unlikely to be approved by any ethics committee. Another alternative approach would be to systematically conduct behavioral assessments throughout treatment each time an adolescent engages in NSSI to determine the immediate preceding and subsequent feelings and thoughts associated with the behaviors.

Motivating and Maintaining Factors. A considerable amount of research has investigated the reasons for engaging in NSSI. By definition, acts of NSSI are not suicidal in intent, thus researchers have sought to identify the intent behind these behaviors. Only with an understanding of the motivating and maintaining factors behind NSSI can appropriate intervention and prevention strategies be implemented. Research

among adults who engage in NSSI has pointed to several motivating factors including tension reduction/emotion regulation, self-punishment, and a decrease in dissociation (Briere & Gil, 1998; Favazza, 1998; Gratz, 2003). Studies addressing adolescents find similar results (Kumar, Pepe, & Steer, 2005; Laye-Gindhu & Schonert-Reichl, 2005; Nixon, Cloutier, & Aggarwai, 2002; Nock & Prinstein, 2004; Nock & Prinstein, 2005; Ross & Heath, 2003). Although useful, as with the adult studies, the following studies have a methodological flaw to be considered: each depends on the adolescent to have enough insight (and honesty) to be able to consciously identify why s/he engaged in NSSI. Additionally, the recency of the NSSI behaviors varies within and across studies, therefore the reliability of the method used, i.e., asking participants why they engaged in NSSI that may have occurred months or even years before, is questionable. Finally, only two of the studies (Laye-Gindhu & Schonert-Reichl, 2005; Ross & Heath, 2003) were conducted among non-referred samples, indicating a need for further research addressing the reasons for engaging in NSSI among adolescents who are not in psychiatric treatment.

Despite the questionable methodology, the results across the several studies (Kumar, Pepe, & Steer, 2004; Laye-Gindhu & Schonert-Reichl, 2005; Nixon, Cloutier, & Agarwai, 2002; Nock & Prinstein, 2004; Nock & Prinstein, 2005; Ross & Heath, 2003) that have assessed reasons for engaging in NSSI among adolescents are quite consistent. The most commonly cited reason for NSSI involves automatic (intrinsic, within oneself) negative reinforcement (ANR; Kumar, Pepe, & Steer, 2004; Nixon, Cloutier, & Agarwai, 2002; Nock & Prinstein, 2004; Nock & Prinstein, 2005; Ross & Heath, 2003), which include a motivation to stop depression, tension, anxiety, and/or fear, and to reduce anger. A smaller minority of participants endorse

engaging in NSSI for automatic positive reinforcement (APR), such as prompting feelings when none exist, and social positive reinforcement (SPR; to elicit attention) and social negative reinforcement (SNR; to remove social responsibilities). Also of note, in the two studies of non-referred adolescents (Laye-Gindhu & Schonert-Reichl, 2005; Ross & Heath, 2003), between 27% and 33% of the participants reporting NSSI reported engaging in NSSI to punish themselves. Typically, adolescents reported engaging in NSSI for several reasons simultaneously (Nixon, Cloutier, & Aggarwai, 2002), and one study found a positive correlation between depression severity and number of reasons for engaging in NSSI (Kumar, Pepe, & Steer, 2004). Finally, no gender differences in reasons for engaging in NSSI have been identified (Kumar, Pepe, & Steer, 2004; Nock & Prinstein, 2005).

Nock & Prinstein (2005) explored whether different reasons for engaging in NSSI, i.e., automatic negative reinforcement (ANR), social negative reinforcement (SNR), automatic positive reinforcement (APR), and social positive reinforcement (SPR), were related to different psychiatric impairments or other demographics characteristics. Having a history of a suicide attempt (in addition to NSSI) and high hopelessness scores were positively correlated with scores on the ANR subscale. A diagnosis of PTSD and MDD were significantly associated with APR. Neither loneliness nor self-perfectionism were associated with scores on any of the subscales, however social-perfectionism and younger age were associated with SNR; younger age was also associated with SPR. Finally, one study found that adolescents engaging in NSSI experienced feelings of addiction to the behaviors. Further, feeling more addicted to NSSI was correlated with engaging in more severe and frequent NSSI (Nixon, Cloutier, & Aggarwai, 2002).

Taken together, the findings from the above studies support the emotion regulation hypothesis of NSSI among adolescents. At

least in terms of self-report data, adolescents from various samples and levels of psychopathology reported engaging in NSSI to regulate, typically to decrease but sometimes to increase, emotions. Additionally, it appears that younger adolescents may be likely to engage in NSSI to elicit social reinforcement. It is possible that the younger adolescents may initiate NSSI for social reasons but maintain engaging in NSSI for internal reinforcement. Again, when interpreting the findings of these studies, it is crucial to recall that the method employed across each study required that the participants have conscious awareness of why they engage NSSI. Assessing motivations for self-injury through alternate means (such as indirect questions and performance-based measures) is suggested for future research. Another option for future research would be to conduct behavioral analyses following acts of NSSI to elucidate the precipitants and consequences that may serve to reinforce the NSSI. Gaining a clear understanding of the motivations for engaging in NSSI is a necessary prerequisite to adequately treating the behavior.

Co-morbid Diagnoses and Correlates of NSSI

Co-morbid Diagnoses. One unknown and important piece of information is the proportion of adolescents who engage in NSSI who meet criteria for a formal psychiatric diagnosis. Again, in order to answer this question, a non-referred, community based sample of adolescents would need to be screened for NSSI and administered diagnostic interviews. Garrison and colleagues (1993) conducted the only published study with adolescents to date that had the capacity to answer this question. However, the paper did not report the rates of diagnoses among those who self-injure; instead it reported the odds of those with different diagnoses to have engaged in

NSSI. The results indicated that those with MDD were 8.3 times more likely to have engaged in NSSI, those with a specific phobia were 8.5 times more likely to have engaged in NSSI, and those with OCD were 5.3 times more likely to have engaged in NSSI than those without the respective disorders. However, in a multivariate model predicting NSSI (entering all significant bivariate relationships) only suicidal ideation, a diagnosis of MDD, and undesirable life events significantly predicted engagement in NSSI. Thus, although OCD and specific phobia were independently associated with NSSI, the depressive symptoms experienced within these disorders may have accounted for the relationship with NSSI.

Several studies conducted among clinical samples of adolescents have reported on the diagnostic profiles of those who engaged in NSSI (Jacobson, Muehlenkamp, & Miller, under review; Kumar, Pepe, & Steer, 2004; Nock, Joiner, Gordon et al., 2006). In each of these studies, the most common diagnosis among the adolescents who have engaged in NSSI was Major Depressive Disorder, with rates falling between 41.6% to 58% (Jacobson, Muehlenkamp, & Miller, under review; Kumar, Pepe, & Steer, 2004; Nock, Joiner, Gordon et al., 2006). The Jacobson et al. study also found high rates of Dysthymic Disorder (29.6%) and Depressive Disorder, NOS (7.4%), thus indicating that 88.9% of the participants engaged in NSSI met criteria for a depressive disorder. In each study a substantial percentage had an anxiety disorder and/or PTSD. Additionally, each study noted a high rate of co-morbidity within the participants engaging in NSSI. Rates of any externalizing disorder and/or substance use disorder were quite high (around 60% for each) in the Nock et al. study. However, the substance abuse rates are inflated as nicotine dependence was included. Again it should be noted that each of the clinical studies

are biased due to the inclusion of only referred or hospitalized participants. It may be assumed that the rates of psychiatric disorders among those who self-injure would be lower among a non-referred sample.

Engagement in NSSI is very common among adults with BPD (Zanarini, Frankenburg, Hennen et al., 2005). Indeed, one of the criteria for a diagnosis of BPD is engagement in self-injurious behaviors or threats, including both suicide attempts and self-mutilation (NSSI; APA, 2000). The rate of BPD among people (adults or adolescents) who engage in NSSI is less clear as only data from a representative, community based study could provide this information. Further, as diagnosing personality disorders in adolescents is quite controversial, little information about the prevalence of BPD in this age group is available.

Two studies conducted among referred samples of adolescents reported on the rates of BPD (or BPD features) in those who self-injure (Jacobson et al., under review; Nock, Joiner, Gordon et al., 2006). Among the admittedly biased samples, the rates of BPD (or BPD features) among the adolescents reporting NSSI ranged from 37% (Jacobson, Muehlenkamp, Miller et al., under review) to 51.7% (Nock, Joiner, Gordon et al., 2006). The higher rate of BPD in the latter study compared to the former is likely due to the fact that the latter only included females and included the parasuicide item in its diagnostic criteria for BPD whereas the Jacobson et al. study did not. Because the rate of BPD in community samples of adolescents is not known, comparisons between the rates found in these studies of adolescents and community samples can not be made. Further research is clearly needed in this area. Another interesting question is: what percentage of adolescents who engage in NSSI will grow up to become adults with BPD? This question may be answered using large longitudinal

databases that screen for NSSI in adolescence and follow the children into adulthood.

Finally, clinical observations and some empirical work (conducted mainly among adult women with eating disorders) suggest that NSSI and eating disorders are associated with one another (Claes, Vandereycken, & Vertommen; 2001; Favazza, DeRosear, & Conterio, 1989; Jacobs & Isaacs, 1986; Whitlock, Eckenrode, & Silverman, 2006). However, none of these studies included both a non-referred sample and a standardized, reliable assessment of eating disorders. To our knowledge, no published studies have addressed the rate of eating disorders among adolescents who engage in NSSI (and vice versa). More research in this area is clearly needed to clarify if a relationship between NSSI and eating disorders does indeed exist.

Risk Factors and Correlates of NSSI. Studies using both community and referred samples have sought to identify risk factors for and correlates of NSSI. Due to the small amount of community-based studies, both clinical and community-based studies are reviewed here, with the qualification that the results drawn from the community studies should be weighed more heavily than the results of the referred, and therefore inherently biased, samples.

A significant amount of attention has focused on gender and ethnicity as risk factors for NSSI. As reviewed above, the data are inconclusive as to whether NSSI is more common among females than males and/or Caucasians than people of other ethnicities. More research is needed to clarify these relationships.

A history of sexual abuse appears to be a specific risk factor for engaging in NSSI (Kiesel & Lyons, 2001; Lipschitz, Winegar, Nicolaou et al., 1999; Zoroglu, Tuzun, Sar et al., 2003). Among various samples of adolescents, a history of sexual abuse significantly predicted engagement

in NSSI in multivariate models (Lipschitz, Winegar, Nicolaou et al., 1999; Zoroglu, Tuzun, Sar et al., 2003), whereas physical abuse was only predictive of NSSI in one of the four studies (Zoroglu, Tuzun, Sar et al., 2003). Further, two of these studies (Kiesel & Lyons, 2001; Zoroglu, Tuzun, Sar et al., 2003) found that dissociation mediated the relationship between sexual abuse and NSSI, suggesting that differences in one's tendency to dissociate accounts for why only a subset of adolescents who are abused engage in NSSI.

Another risk factor associated with NSSI is negative life events. Garrison and colleagues (1993) identified a diagnosis of MDD, suicidal ideation, and past negative life events (total number) as the only significant predictors of NSSI in a model that included many additional covariates.

There is some research that suggests biological differences in people who engage in NSSI versus those who do not, although no research has addressed this issue among adolescent populations. The majority of the research that has addressed the biology of self-injury has been conducted among women with BPD, and in the majority of cases, suicidal and non-suicidal self-injury are not differentiated (see Simeon & Hollander, 2001 and Winchel & Stanley, 1991 for review). Despite these short-comings, research suggests altered serotonergic function (New, Trestmen, Mitropoulou et al., 1997; Simeon, Stanley, Frances et al., 1992) and endogenous opiate function (Coid, Allolio, & Rees, 1983) in people who engage in impulsive self-injury (of different intent). A detailed discussion of these findings is outside the scope of this review. The reader is directed to Simeon and Hollander (2001) and Winchel and Stanley (1991) for reviews of this emerging literature base. Identifying biological correlates or even causes of NSSI would directly impact the treatment approach and is, therefore, crucial to this field. Much further research is needed in

both adult and adolescents populations of NSSI to identify biological underpinnings.

Finally, several psychosocial correlates of NSSI among adolescents have been identified in the literature including depression, anxiety, alexithymia, hostility, negative self-esteem, antisocial behavior, anger, smoking, and emotional reactivity (Garrison, Cheryl, McKeown et al., 1993; Kiesel & Lyons, 1999; Laye-Gindhu & Schonert-Reichl, 2005; Makikyo, Hakko, Timonen et al., 2004; Ross & Heath, 2003; Zoroglu, Tuzun, Sar et al., 2003). As is apparent from this list, many of these risk factors are nonspecific and linked to many other pathological outcomes. Thus, it is likely a unique combination of these risk factors that lead one to engage in NSSI. The research that has addressed the correlates of NSSI can be broken into two groups: 1) community based studies that compare scores on measures of psychosocial variables between the NSSI group and the "healthy" (no-NSSI) group, and 2) clinically based studies that compare groups of psychiatrically impaired adolescents who have engaged in NSSI to psychiatrically impaired adolescents who have not engaged in NSSI.

Results from community-based studies indicate that adolescents who engage in NSSI have higher levels of anxiety, depression, hostility, negative self-esteem, anger, antisocial behaviors, suicidal ideation, and dissociation than the adolescents that do not engage in NSSI (Garrison, Cheryl, McKeown et al., 1993; Ross & Heath, 2003; Zoroglu, Tuzun, Sar et al., 2003). Clinical investigations have also found higher rates of dissociation and alexithymia among adolescents who engage in NSSI compared to adolescents who are psychiatrically impaired but not engaging in NSSI (Kiesel & Lyons, 1999). Additionally, one study by a group in Finland found that among a group of 157 12 to 17 year olds regular daily smoking increased the odds of engaging in NSSI three-fold

compared to those who did not smoke daily (Makikyo, Hakko, Timonen et al., 2004); smoking was only associated with NSSI among girls (not boys) in another study (Laye-Gindhu & Schonert-Reichl, 2005).

Although depression is identified as a correlate of NSSI in community studies, it should be noted that the Jacobson and colleagues (under review) study found similar levels of depression, as rated by the BDI, between adolescents who had engaged in NSSI and adolescents who had not engaged in any self-harm, all of whom were receiving outpatient psychiatric treatment. Further research is needed to identify specific risk factors, above and beyond depression and anxiety, that lead to engagement in NSSI.

Nock and colleagues (Najmi, Wegner, & Nock, under review; Nock, Wedig, & Holmberg, in press) have targeted emotion reactivity and thought suppression as two potentially specific correlates. Theory hypothesizes that having poorer emotion regulation skills and higher levels of emotional reactivity leave people at risk for engagement in NSSI (Linehan, 1993). Preliminary research among adolescents supports this hypothesis, as emotional reactivity was associated with the presence of NSSI and emotional reactivity acted as a mediator between psychopathology and NSSI (Nock, Wedig, & Holmberg, in press). Further, higher scores on a measure of thought suppression (extent to which one tries to suppress unwanted thoughts) were associated with the presence and frequency of NSSI, and thought suppression acted as a mediator between emotional reactivity and NSSI (Najmi, Wegner, & Nock, under review). The pattern of these results, that both emotional reactivity and thought suppression were linked to NSSI, support the treatment model of Dialectical Behavior Therapy (Linehan, 1993) as it targets emotional reactivity with emotion regulation skills and a tendency to try to

avoid negative thoughts with mindfulness and radical acceptance skills. A weakness of each of Nock and colleagues' studies should be noted: the sample was one of convenience in which they over-sampled for people who engaged in self-injurious behaviors. These results need to be replicated in more representative samples.

In summary, a large list of risk factors and correlates accompany engagement in NSSI. One apparently specific risk factor is a history of sexual abuse paired with a tendency to dissociate. Additionally, the recent research by Nock and colleagues suggests that those who tend to be high in emotional reactivity and thought suppression and are experiencing psychological distress are at an increased risk for NSSI. Further research is needed to determine whether the combination of characteristics identified in the Nock and colleagues' studies are specifically related to NSSI as opposed to other self-destructive behaviors.

Overlap between Suicide and Non-suicidal Self-injury

The relationship between suicide and NSSI among adolescents and adults is complex. First, it is not yet known whether people who engage in NSSI are at increased risk for completing suicide, other than the fact that they are at increased risk for suicide attempts which in turn leaves them at-risk for completing suicide. It is also unknown whether NSSI typically precedes suicide attempts, serving as "practice" for ultimate attempts and completions, as hypothesized by Joiner's theory (see Joiner, 2006). Only prospective, longitudinal studies will be able to answer these questions. Theory suggests that NSSI is in fact the anti-thesis to suicide (Favazza, 1998). However, at the same time, theory posits that people who engage in self-mutilation may become isolated, hopeless, and despairing because they cannot stop

the behavior, which then leads them to become suicidal (Gratz, 2003).

A good deal of empirical research has now documented a large amount of within person overlap between suicide attempts and engagement in NSSI. It is clear that adolescents who engage in NSSI are more likely to have also attempted suicide, and vice versa (Garrison, Cheryl, McKeown et al., 1993; Jacobson, Muehlkamp, & Miller, under review; Laye-Gindhu & Schonert-Reichl, 2005; Lipschitz, Winegar, & Nicolaou et al., 1999; Muehlenkamp & Gutierrez, 2007). However, as noted above, it is not clear whether NSSI acts as a predictor for, in that it precedes, suicide attempts.

A handful of studies, each using slightly different methodology have sought to identify specific psychosocial characteristics that differentiate between adolescents who attempt suicide and those who engage in NSSI (Guertin, Spirito, Donaldson et al., 2001; Jacobson, Muehlenkamp, & Miller, under review; Muehlenkamp & Gutierrez, 2004, 2007; Zlotnick, Donaldson, Spirito et al., 1997). Overall, these studies have failed to yield clear conclusions.

Two studies have compared adolescents who engaged in both suicide attempts and NSSI versus adolescents who only attempted suicide (Guertin, Lloyd-Richardson, Spirito et al., 2001; Jacobson, Muehlenkamp, & Miller, under review). The study that included inpatients found that those who had engaged in both types of self-harm behaviors were more depressed, lonely, angry, and engaged in more risk-taking overall than those who had only attempted suicide (Guertin, Lloyd-Richardson, Spirito et al., 2001). The study that included outpatients identified a similar pattern, such that those who attempted suicide and self-injured were higher in depression and suicidal ideation than those who only attempted suicide, but the differences between the two groups were not significant (Jacobson, Muehlenkamp, & Miller, under review).

Similarly, of the two studies that compared adolescents who had *only* engaged in NSSI versus those who had *only* attempted suicide, one, that included a community sample, found no differences in depression or suicidal ideation between the two groups (Muehlenkamp & Gutierrez, 2004), whereas the other, that included psychiatric outpatients, found similar depression levels in the two groups but higher suicidal ideation in the suicide attempt group (Jacobson, Muehlenkamp, & Miller, under review).

Finally, two studies (Jacobson, Muehlenkamp, & Miller, under review; Muehlenkamp & Gutierrez, 2007) compared adolescents who had engaged in both self-harm behaviors versus those who had *only* engaged in NSSI. Results from both studies found that the combined group reported more suicidal ideation than the NSSI only group. One of the studies found lower depression levels in the NSSI group compared to the combined group as well (Jacobson, Muehlenkamp, & Miller, under review).

In conclusion, the results of these studies indicate that depression is likely not a specific risk factor for NSSI as compared to suicide attempts. Further, two of the three studies that addressed NSSI versus suicide attempts (with and without comorbid NSSI) provided support that suicidal ideation is a risk factor specific to suicide attempts and not NSSI (Jacobson, Muehlenkamp, & Miller, under review; Muehlenkamp & Gutierrez, 2007), however a third study failed to find such a relationship (Muehlenkamp & Gutierrez, 2004). In addition, there is some support that adolescents who engage in both suicide attempts and NSSI are more impaired than those who do one or the other and may require more intensive treatment. None of these studies identified risk factors for NSSI that do not act as risk factors for suicide attempts. Much further research is needed in this area. In addition, research

is needed to clarify the temporality of NSSI and suicide attempts and the factors that differentiate between the two: NSSI and suicide attempts.

CONCLUSIONS AND DIRECTIONS FOR FUTURE RESEARCH

This article reviewed the empirical research addressing NSSI among adolescents, a behavior that is receiving increased attention by researchers and clinicians due to its seemingly increasing occurrence and the recent movement in the field to differentiate NSSI from suicidal behaviors. Because the movement to separate NSSI from suicide within empirical research studies is fairly recent, there remains a significant amount of work to be done addressing aspects of NSSI from prevalence and gender distribution to causal factors and maintaining factors.

The current review included approximately 22 empirical studies that addressed NSSI in adolescents, the large majority of which were relatively small, cross-sectional designs. About one quarter of those studies used community-based samples while the others included participants from clinical settings: outpatient and inpatient. Data from these studies indicated a lifetime prevalence rate of NSSI between 13% and 23% and suggest that the prevalence is indeed increasing, however, further research is needed to verify this conclusion. Findings are inconclusive as to whether females are more likely to engage in NSSI than males, again, further research is needed to clarify this relationship in addition to determining if the prevalence of NSSI differs by ethnic group.

Very little is known about the psychiatric diagnoses among adolescents who engage in NSSI as no published study has surveyed a non-referred sample of adolescents for NSSI and reported on their respective psychiatric diagnoses. Prospective, longitudinal research is needed to

determine what percentage of adolescents who engage in NSSI will continue to engage in NSSI into adulthood, as well as the risk factors for continued engagement. Several correlates of NSSI among adolescents have been identified including a history of sexual abuse, depression, anxiety, alexithymia, hostility, smoking, suicidal ideation, and dissociation, in addition to thought suppression and emotional reactivity. More research is needed to address potential biological vulnerabilities for NSSI.

Results from studies attempting to identify reasons for engaging in NSSI are consistent and support the emotion regulative nature of NSSI. However, the studies that have addressed the function of NSSI have relied on the adolescents to have insight into why they engage in NSSI. Thus, it is possible that although the adolescents believe that they are self-injuring because it is effective at releasing negative affect, it may be just as effective at garnering attention or help from others which also act as reinforcement for the behavior. Further research using less direct methods of assessment and hypothesis testing is needed in this area in order to inform treatment and prevention efforts.

Although several studies have attempted to identify risk factors specific to NSSI as opposed to suicide attempts, the only clear indicator is that those who attempt suicide have more suicidal ideation than those who engage in NSSI. Thus, while we know that adolescents may engage in NSSI in the absence of suicidal ideation, it is yet unclear what leads some teens to engage in NSSI and others to attempt suicide. Additionally, it is not yet clear what leads some adolescents to engage in NSSI only, while others engage in NSSI and suicide attempts, nor has research demonstrated the risk factors for engagement in repetitive NSSI.

Finally, only longitudinal designs will allow us to answer whether NSSI typically

precedes suicide attempts and/or completed suicide. At this point, only a cross-sectional relationship between suicide attempts and NSSI has been verified. If we are able to support the hypothesis that NSSI acts as a “warm up” or “practice” for subsequent suicide attempts and/or completions, the ability to prevent suicide increases dramatically. The clinical implications of NSSI preceding suicide attempts are substantial as it would support the wide spread screening for NSSI in junior high and high schools in order to provide early intervention for adolescents who are self-injuring with the goal of preventing subsequent suicide attempts.

Given the conclusion that NSSI is increasing in prevalence among teenagers, is more pervasive than suicide attempts, and is linked to significant psychological suffering, continued research addressing the causal factors and effective prevention and intervention for adolescents engaged in NSSI is clearly indicated. Clinicians working with adolescents should routinely assess for NSSI in addition to suicidal thoughts and behaviors, with the awareness that a child may be engaging in NSSI in the absence of any suicidal ideation. Additionally, as it is unclear which psychiatric diagnoses are most specifically linked to NSSI, clinicians should include an assessment of NSSI within each intake evaluation regardless of the referral question.

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