



Examining the link between nonsuicidal self-injury and suicidal behavior: A review of the literature and an integrated model

Chloe A. Hamza ^{a,*}, Shannon L. Stewart ^{b,c}, Teena Willoughby ^a

^a Department of Psychology, Brock University, 500 Glenridge Avenue, St. Catharines, Ontario, Canada, L2S3A1

^b Ministry of Child and Youth Services, The Child and Parent Resource Institute, 600 Sanatorium Road, London, Ontario, Canada, N6H 3W7

^c Department of Psychiatry, Division of Child and Adolescent Psychiatry, University of Western Ontario, Schulich School of Medicine and Dentistry, 1151 Richmond Street, London, Ontario, Canada, N6A 3K7

ARTICLE INFO

Article history:

Received 7 November 2011
 Received in revised form 26 April 2012
 Accepted 3 May 2012
 Available online 11 May 2012

Keywords:

Nonsuicidal self-injury
 Suicidal behavior
 Self-injurious behavior
 Review
 Adolescents
 Adults

ABSTRACT

Self-injurious behaviors (SIB) refer to behaviors that cause direct and deliberate harm to oneself, including nonsuicidal self-injury (NSSI), suicidal behaviors, and suicide. Although in recent research, NSSI and suicidal behavior have been differentiated by intention, frequency, and lethality of behavior, researchers have also shown that these two types of self-injurious behavior often co-occur. Despite the co-occurrence of NSSI and suicidal behavior, however, little attention has been given as to why these self-injurious behaviors may be linked. Several authors have suggested that NSSI is a risk factor for suicidal behavior, but no comprehensive review of the literature on NSSI and suicidal behavior has been provided. To address this gap in the literature, we conducted an extensive review of the research on NSSI and suicidal behavior among adolescents and adults. First, we summarize several studies that specifically examined the association between NSSI and suicidal behavior. Next, three theories that have been proposed to account for the link between NSSI and suicidal behavior are described, and the empirical support for each theory is critically examined. Finally, an integrated model is introduced and several recommendations for future research are provided to extend theory development.

© 2012 Elsevier Ltd. All rights reserved.

Contents

1. Introduction	483
2. Nonsuicidal self-injury (NSSI)	483
3. Suicidal thoughts and behaviors	483
4. Differentiating forms of self-injury	484
5. The link between NSSI and suicidal behavior	484
6. Search and inclusion criteria	484
7. NSSI as a risk factor for suicidal behavior	484
8. Research on NSSI and suicidal behaviors	488
9. Explaining the link between NSSI and suicidal behavior	490
9.1. The Gateway Theory	490
9.2. The Third Variable Theory	490
9.3. Joiner's Theory of Acquired Capability for Suicide	491
10. An integrated model	492
11. Recommendations for future research	493
12. Conclusions	493
References	494

* Corresponding author. Tel.: +1 905 688 5550x5455.

E-mail addresses: ch08za@brocku.ca (C.A. Hamza), Shannon.Stewart@ontario.ca (S.L. Stewart), teena.willoughby@brocku.ca (T. Willoughby).

1. Introduction

Self-injurious behaviors (SIB) are behaviors that cause direct and deliberate harm to oneself, including nonsuicidal self-injury, suicidal behavior, and suicide (Nock, 2010; Nock, Joiner, Gordon, Lloyd-Richardson & Prinstein, 2006). Self-injurious behaviors are a serious health concern (Boxer, 2010; Jacobson, Muehlenkamp, Miller, & Turner, 2008), as estimates indicate that as many as 13 to 29% of adolescents (Baetens, Claes, Muehlenkamp, Grietens, & Onghena, 2011; Brausch & Gutierrez, 2010; Heath, Toste, & Beettam, 2007; Ross & Heath, 2002) and 4–6% of adults (Briere & Gil, 1998; Klonsky, 2011) engage in nonsuicidal self-injury (NSSI), such as self-cutting, burning, and biting without lethal intent (Gratz, Conrad, & Roemer, 2002; Heath, Toste, Nedecheva, & Charlebois, 2008; Klonsky & Olino, 2008). Moreover, as many as 4–8% of individuals report having made a prior suicide attempt (Bebbington et al., 2010; Whitlock & Knox, 2007), and estimates are even higher among inpatient samples (Claes et al., 2010; Jacobson et al., 2008). Although NSSI and suicidal behavior are both forms of self-injurious behavior, these behaviors have been differentiated on the basis of intention, frequency, and lethality (Guertin, Lloyd-Richardson, Spirito, Donaldson, & Boergers, 2001; Muehlenkamp & Gutierrez, 2007). Despite the important differences between NSSI and suicidal behavior, however, research has shown that these behaviors can also co-occur among clinical and community-based samples (Guertin et al., 2001; Nock et al., 2006; Stanley, Winchell, Molcho, Simeon, & Stanley, 1992). Yet, little attention has been paid as to why NSSI and suicidal behavior may be associated. To address this gap in the literature, we conducted an extensive review of the research on self-injurious behaviors among adolescents and adults. First, we present the results of our review by providing a summary of findings from several studies on the link between NSSI and suicidal behavior. Next, we describe three different theories that have been proposed to account for the link between NSSI and suicidal behavior, and then we provide an evaluation of the empirical support for or against each of these three theories. Finally, an integrated model to account for the link between NSSI and suicidal behavior is introduced, and several specific recommendations for future research are provided to extend theory development.

2. Nonsuicidal self-injury (NSSI)

Nonsuicidal self-injury (NSSI) is defined as self-directed, deliberate destruction or alteration of bodily tissue in the absence of suicidal intent (Nock & Favazza, 2009), and includes behaviors such as self-cutting, head banging, burning, self-hitting, scratching to the point of bleeding, and interfering with wound healing (Heath et al., 2008; Nock, 2010). Estimates of prevalence suggest that among clinical inpatient samples, as many as 21% of adults (Briere & Gil, 1998) and 30 to 40% of adolescents engage in NSSI (Darche, 1990; Jacobson et al., 2008). NSSI is not only a clinical health concern, however, as recent estimates based on community samples indicate that as many as 13 to 29% of adolescents (Baetens et al., 2011; Brausch & Gutierrez, 2010; Heath et al., 2007; Ross & Heath, 2002) and 4–6% adults engage in NSSI (Briere & Gil, 1998; Klonsky, 2011). Across both clinical and community-based samples, research has shown that NSSI tends to have its onset in adolescence, and most commonly occurs between the ages of 13 and 15 years (Glenn & Klonsky, 2009; Heath et al., 2008; Nock, 2010; Nock & Prinstein, 2004; Whitlock & Knox, 2007), which has led researchers to conclude that adolescence represents a period of increased risk for initiation and engagement in NSSI (Muehlenkamp & Gutierrez, 2007; Ross & Heath, 2002).

There is some evidence that NSSI is more prevalent among females than males in adolescence (Baetens et al., 2011; Muehlenkamp & Gutierrez, 2007; Plener, Libal, Keller, Fegert, & Muehlenkamp, 2009; Prinstein et al., 2008; Ross & Heath, 2002; Yates, Tracy, & Luthar, 2008), although other researchers have found no sex differences in the prevalence of NSSI (Andover, Primack, Gibb, & Pepper, 2010; Asarnow et al.,

2011; Jacobson et al., 2008; Muehlenkamp & Gutierrez, 2004; Nock & Prinstein, 2004; Nock et al., 2006). It is interesting to note, however, that researchers assessing NSSI among early and late adults do not find gender differences in the prevalence of NSSI in clinical or community-based samples (Bureau et al., 2010; Claes et al., 2010; Darke, Torok, Kaye, & Ross, 2010; Gratz et al., 2002; Heath et al., 2008), suggesting that gender differences may be more pronounced in early adolescence. In one study on gender differences in NSSI, it was found that female adolescents reported a significantly earlier age of NSSI onset than boys, which may help to account for why some researchers find that females engage in more NSSI than boys during the adolescent period (Andover et al., 2010; see Nixon, Cloutier, & Aggarwal, 2002 for a similar finding). Consistently, researchers have found that females are more likely to engage in self-cutting behaviors, whereas boys are more likely to engage in self-hitting and burning behaviors (Andover et al., 2010; Whitlock, Muehlenkamp, & Eckenrode, 2008).

Researchers have also shown that NSSI occurs in various parts of the world, including the United States (Andover & Gibb, 2010; Brausch & Gutierrez, 2010; Dougherty et al., 2009; Muehlenkamp & Gutierrez, 2004), Canada (Bureau et al., 2010; Heath et al., 2008), Australia (Darke et al., 2010; Maddock, Carter, Murrell, Lewin & Conrad, 2011), China (Tang et al., 2011), Germany (Plener et al., 2009) Scotland (Young, Sweeting, & West, 2006), Turkey (Zoroglu et al., 2003), Belgium (Claes et al., 2010) and Britain (Bebbington et al., 2010). There is some evidence to suggest that Caucasians may be at increased risk for NSSI as compared to other ethnicities (Muehlenkamp & Gutierrez, 2004, 2007; see Jacobson & Gould, 2007 for a review); however, other researchers have reported no differences in NSSI prevalence among varying ethnicities (Brausch & Gutierrez, 2010; Jacobson et al., 2008; Plener et al., 2009). Given that much of the research on ethnic differences has relied on primarily Caucasian samples, and that NSSI has yet to be included in large-scale epidemiological surveys, more research using large and diverse samples is needed to specifically examine NSSI prevalence across ethnicities.

3. Suicidal thoughts and behaviors

Suicidal behaviors refer to directly self-injurious behaviors (e.g., suicide attempt, suicide) that are engaged in *with the intent* to end one's life such as hanging/strangulation, severe cutting, and jumping from heights (Andover & Gibb, 2010; Nock, 2010), whereas suicidal thoughts refer to thinking about or planning to engage in behaviors to end one's life (i.e., suicidal ideation or plan) (Nock, 2010; Nock et al., 2008). Among community-based samples, as many as 4–8% of adolescents and adults report having made at least one suicide attempt (Muehlenkamp & Gutierrez, 2007; Nock et al., 2008; Whitlock & Knox, 2007). Estimates are higher among clinical-based samples, with as many as 24–33% of adolescents (Asarnow et al., 2011; Jacobson et al., 2008) and 35–40% of adults reporting a history of suicidal attempts (Claes et al., 2010). According to a recent report from the World Health Organization, the global mortality rate for death by suicide is 14.5/100,000, making suicide the fourth leading cause of death among individuals aged 15–44 years (Krug, Dahlberg, Mercy, Zwi, & Lozono, 2002). Suicidal behavior tends to have its onset in late adolescence (Darke et al., 2010; Nock et al., 2008) and statistics indicate that adolescents report higher levels of suicidal ideation than any other age group (Krug et al., 2002; Nock et al., 2008). The greatest number of deaths by suicide, however, occurs in middle adulthood (Krug et al., 2002; Nock et al., 2008; Stats Canada, 2008), suggesting that although suicidal behavior may have its onset in adolescence, middle adulthood represents the period of greatest risk for death by suicide.

Consistently, researchers find that females are more likely to attempt suicide than males (Baetens et al., 2011; Darke et al., 2010; Plener et al., 2009; Prinstein et al., 2008; Tang et al., 2011; Whitlock & Knox, 2007), but males are more likely to die by suicide than females across the lifespan (Krug et al., 2002; Nock et al., 2008). In fact, for every one female death by suicide, it is estimated that three males die

by suicide worldwide (Krug et al., 2002). According to one recent epidemiological review, the highest rates of suicide occur in Eastern and Central Europe (Nock et al., 2008), and there is some evidence to suggest Caucasians may be at increased risk for suicide as compared to other ethnicities (Krug et al., 2002). Individuals of indigenous groups, however, are also at increased risk for death by suicide (Krug et al., 2002; Nock et al., 2008).

4. Differentiating forms of self-injury

Although NSSI and suicidal behaviors are both forms of self-injurious behavior (SIB), NSSI and suicidal behaviors have been differentiated in three important ways: intention, repetition, and lethality (Baetens et al., 2011; Guertin et al., 2001; Muehlenkamp & Gutierrez, 2004). The primary distinction between NSSI and suicidal behavior is related to the intention of the individual engaging in the self-injurious behavior (Nock, 2010). Unlike individuals who engage in suicidal behavior, individuals who engage in NSSI do not intend to end their own life, or perceive that death will result from engaging in NSSI behaviors (Andover & Gibb, 2010; Favazza, 1998; Patton et al., 1997). Individuals who engage in NSSI and suicidal self-injury (i.e., attempt suicide), therefore, may be similarly motivated to find relief from distressing affective states (Brown, Comtois, & Linehan, 2002), but individuals who engage in suicidal behavior are differentiated from individuals who engage in NSSI by the desire to end their own life (Muehlenkamp, 2005; Muehlenkamp & Gutierrez, 2004). Consistent with this distinction, adolescents who engage in NSSI can be differentiated from adolescents with a history of suicide attempt by more positive attitudes toward life, and more negative attitudes toward death (Muehlenkamp & Gutierrez, 2004).

Nonsuicidal self-injury and suicidal behavior (i.e., suicidal attempts) can be further differentiated in terms of frequency and lethality of behavior (Briere & Gil, 1998; Favazza & Rosenthal, 1993; Muehlenkamp, 2005; Muehlenkamp & Gutierrez, 2007). NSSI often involves low lethality methods (e.g., cutting, burning, biting) whereas suicidal behavior tends to involve high lethality methods (e.g., overdose, wrist cutting, hanging) (Andover & Gibb, 2010). NSSI also tends to occur more frequently as compared to suicidal behavior, particularly among clinical samples. For example, in a sample of adolescent inpatients who engaged in NSSI, the mean number of NSSI incidents in the past year was eighty (Nock & Prinstein, 2004), whereas among adolescent inpatients with at least one prior suicide attempt, the mean number of lifetime suicide attempts was 2.8 (Nock et al., 2006). Similarly, in a sample of adult inpatients, the mean number of lifetime NSSI incidents was 156, and the mean number of suicide attempts was 2.0 (Andover & Gibb; see also Claes et al., 2010). Among community-based samples, both frequency of NSSI and suicidal attempts are lower than among clinical samples, with estimates suggesting that the vast majority of youth and young adults report having made only 1 prior suicidal attempt (Brausch & Gutierrez, 2010; Muehlenkamp & Gutierrez, 2007; Whitlock & Knox, 2007), and engaged in 2–10 incidents of NSSI (Heath et al., 2008; Muehlenkamp & Gutierrez, 2007; Whitlock & Knox, 2007).

Despite the important differences between NSSI and suicidal behavior, however, these two forms of self-injurious behavior commonly co-occur among clinical and community-based samples (Jacobson et al., 2008; Nock et al., 2006). For example, in a study of 6–8th graders, 10% of pre-adolescents with a history of NSSI also reported a suicide attempt in the past year (Hilt, Nock, Lloyd-Richardson, & Prinstein, 2008). Among outpatient samples of adolescents, 33–37% of adolescents with a history of NSSI also reported having made at least one suicidal attempt (Asarnow et al., 2011; Jacobson et al., 2008). A high co-occurrence of NSSI and suicidal attempts has also been observed among younger and older adults. More specifically, of those adults reporting a history of NSSI, 16–25% report both a history NSSI and suicidal attempt (Bebbington et al., 2010; Kleespies et al., 2011; Wilcox et al., 2011). Given the high co-occurrence of NSSI and suicidal behaviors,

researchers have concluded that although NSSI and suicidal behaviors may differ in important ways, these behaviors are also related (Stanley, Gameroff, Michalsen, & Mann, 2001).

5. The link between NSSI and suicidal behavior

Over the past decade, several researchers have suggested that NSSI is a risk factor for suicidal behavior on the basis of research showing that a prior history of self-injury is one of the strongest predictors of suicidal attempts both cross-sectionally and longitudinally (e.g., Boxer, 2010; Chartrand, Sareen, Toews, & Bolton, 2011; Corcoran, Reulbach, Perry, & Arensman, 2010; Haw, Bergen, Casey, & Hatwon, 2007; Hawton & Harriss, 2008; McAuliffe, Arensman, Keeley, Corcoran, & Fitzgerald, 2007; Sinclair, Hawton, & Gray, 2010; for a review, see Portzky & van Heeringen, 2007), as well as research that individuals receiving inpatient care who report prior engagement in self-injury are at greater risk for death by suicide following or during treatment than individuals without a history of self-injury (Hunt et al., 2007; King, Baldwin, Sinclair, & Campbell, 2001; Powell, Geddes, Hawton, Deeks, & Goldacre, 2000). Although these studies indicate that directly self-injurious behavior may serve as precursor to suicidal behavior, these studies did not differentiate self-injurious behaviors on the basis of lethal or non-lethal intent. It is unclear from these findings, therefore, whether nonsuicidal self-injury specifically increases risk for future suicidal behavior, because NSSI has been confounded with suicidal attempts. To determine whether NSSI, as distinguished from nonfatal suicidal attempts, may increase risk for suicidal behavior, we conducted an extensive review of the literature.

6. Search and inclusion criteria

To identify studies in which researchers specifically examined the link between NSSI and suicidal behavior, we conducted an electronic review of the literature using PsychInfo, PsychArticles, ERIC, CINAHL, PUBMED, and MEDLINE. We limited our review to peer-reviewed articles written in English, and included all articles published prior to January 20, 2012. We searched for articles using any combination of the following key terms: 'self injury' or 'self injurious behavior' or 'deliberate self harm' or 'self harm' or 'self mutilative' behavior or 'nonsuicidal self-injury' or 'parasuicide' or 'cutting' and 'suicide' or 'suicidal thoughts' or 'suicidal attempt.' All search terms were followed by a wildcard asterisk. In total, 691 articles, excluding duplicates, were retrieved and reviewed by the primary author. The criteria for inclusion in the present review were established jointly by all three authors, and all authors agreed on the studies selected for review. Articles were included in the review only if the researchers differentiated NSSI and suicidal behavior using established clinical guidelines, whereby only directly self-injurious behaviors involving zero lethal intent were regarded as NSSI, and any self-injurious behaviors involving ambivalent or lethal intent were regarded as suicidal behavior (Kleespies et al., 2011; Muehlenkamp, Kerr, Bradley, & Adams, 2010; Nock, 2010; Ougrin et al., 2011). Any studies that grouped NSSI and suicidal behavior into one category of deliberate self-harm, therefore, were excluded. In addition, given our interest in the link between NSSI and suicidal behavior, articles that focused only on NSSI or only on suicidal behavior (e.g., risk factors for NSSI only, treatment for NSSI only) were excluded. We also did not include book reviews, case studies involving only one participant, samples of prison inmates, or studies testing the psychometric properties of self-harm scales. We included studies that examined a) whether NSSI was a predictor of suicidal behavior and/or b) compared individuals engaging in NSSI to individuals engaging in suicidal behavior across risk factors.

7. NSSI as a risk factor for suicidal behavior

On the basis of our literature search, we selected 31 studies that met the inclusion criteria for the present review. First, we provide a

Table 1
Summary of studies on NSSI as a risk factor for suicidal behavior.

Study	Sample	Design	Assessment of self-injury	Results
Andover and Gibb (2010)	117 inpatient adults Mage = 39.45	Cross-sectional	Suicide Behavior Questionnaire (SBQ) Suicidal Intent Questionnaire (SIQ)	NSSI history/frequency → SA history/frequency even after controlling for depressive symptoms, hopelessness, BPD, and current suicidal ideation.
Asarnow et al. (2011)	327 depressed adolescents Mage = 15.9	Longitudinal	Schedule for Affective Disorders and Schizophrenia for School-Aged Children—Present and Lifetime Versions (K-SADS-PL)	NSSI history → SA history at baseline and at 24 weeks follow-up after controlling for age, gender, race, parental SES, depression, anxiety, PTSD, conduct disorder, physical abuse, and global adjustment. SA at baseline did not predict NSSI as 24 weeks follow-up.
Brunner et al. (2007)	5759 adolescents in high school Mage = 14.9	Cross-sectional	Schedule for Affective Disorders and Schizophrenia for School-Aged Children	NSSI history → history of suicidal ideation and history of SA.
Claes et al. (2010)	128 inpatient adults Mage = 35.62	Cross-sectional	Self-Injury Questionnaire—Treatment Related (SIQ-TR) Suicidal Ideation Scale (SIS)	Individuals who engaged in NSSI were significantly more likely to have made a SA than individuals with no NSSI history.
Darke et al. (2010)	400 adult illicit drug users Mage = 35.4	Cross-sectional	Structured interview—“Have you ever harmed yourself without suicidal attempt? Have you ever attempted suicide?”	NSSI frequency → frequency of SA after controlling for age and gender. NSSI onset was significantly earlier than age of first SA.
Favaro et al. (2008)	95 outpatient young adults with diagnosed eating disorders Mage = 23.6	Cross-sectional	Diagnostic interview—frequency of skin cutting, burning, hair pulling, nail biting, skin picking and self-hitting without suicidal intent and frequency of suicide attempts	NSSI history → SA history (both moderate and extreme forms of NSSI).
Garrison et al. (1993)	444 depressed adolescents (11–18 years)	Cross-sectional	Schedule for Affective Disorders and Schizophrenia for School-Aged Children—Present and Lifetime Versions (K-SADS-PL)	SA history and suicidal ideation → NSSI history controlling for age and race.
Glenn and Klonsky (2009)	205 young adults in university with NSSI history Mage = 18.5	Cross-sectional	Inventory of Statements about Self-Injury (ISAS) Youth risk Behaviors Survey	NSSI history → SA history. Individuals with a history of NSSI were 8 times more likely to consider suicide and 25 times more likely to attempt suicide than individuals without a history of NSSI.
Lloyd-Richardson et al. (2007)	633 adolescents in high school Mage = 15.5	Cross-sectional	Functional Assessment of Self Mutilation (FASM) Suicidal Ideation Questionnaire (SIQ)	Individuals who engaged in NSSI (minor and moderate) were more likely to have made a suicide attempt than individuals with no NSSI history.
Nock et al. (2006)	89 inpatient adolescents with NSSI history Mage = 14.7	Cross-sectional	Functional Assessment of Self Mutilation (FASM) Diagnostic Interview Schedule for Children (DISC)	NSSI # of methods and # years engaging in NSSI were associated with # of SA attempts, but frequency of NSSI did not predict frequency of SA
Prinstein et al. (2008)	665 inpatient adolescents Mage = 13.51	Longitudinal	Frequency of self-harm without lethal intent (e.g., burning, cutting self) Suicidal Ideation Questionnaire (SIQ)	NSSI frequency at baseline → greater suicidal ideation at baseline, and NSSI at baseline predicted lower suicidal ideation remission slopes post treatment.
Schwartz et al. (1989)	41 outpatient adolescents in drug treatment Mage = 15.0	Cross-sectional	Diagnostic and Statistical Manual III revised edition	More frequent NSSI → more frequent suicidal attempts.
Tang et al. (2011)	2013 adolescents in high school Mage = 15.6	Cross-sectional	Functional Assessment of Self Mutilation (FASM) Suicidal ideation and attempt in the past 12 months (e.g., “During the past 12 months, did you ever attempt suicide?”)	NSSI history → SA history (for minor and moderate/severe NSSI), after controlling for age, sex, parental marital status, depressive symptoms and suicidal ideation.
Whitlock et al. (2008)	2877 young adults in university	Cross-sectional	Self-report Frequency of 16 self-injurious behaviors, and whether there was suicidal intent. Self reported suicidal ideation or attempt	NSSI history → greater frequency of suicidal behavior (ideation, plans, attempts), after controlling for childhood abuse.
Whitlock and Knox (2007)	2875 young adults in university	Cross-sectional	Self-report Frequency of 16 self-injurious behaviors, and whether there was suicidal intent. Self reported suicidal ideation or attempt	NSSI frequency → greater frequency of suicidal behavior (ideation, plans, attempts), but only up to 50 NSSI episodes.

(continued on next page)

Table 1 (continued)

Study	Sample	Design	Assessment of self-injury	Results
Wilcox et al. (2011)	1081 young adults in university (17–19 years)	Cross-sectional	Intentional self harm without lethal intent (e.g., cutting, burning) International diagnostic interview “When was the last time you attempted suicide?”	Individuals who engaged in NSSI reported significantly greater suicidal ideation and were more likely to have made an SA than individuals who did not engage in NSSI.
Wilkinson et al. (2011)	164 adolescents receiving treatment for depression Mage = 14.2	Longitudinal	Schedule for Affective Disorders and Schizophrenia for School-Aged Children—Present and Lifetime Versions (K-SADS-PL)	NSSI history → SA history at baseline and at 28 weeks follow-up, controlling for hopelessness, family functioning, age and sex. SA history did not predict NSSI over 28 weeks follow-up.
Zlotnick et al. (1997)	62 inpatient adolescents Mage = 14.9	Cross-sectional	The Self-Injury Inventory (SII)	Suicide attempters reported significantly more methods of NSSI than suicidal ideators, though groups did not differ in the frequency of NSSI.

Note: SA = suicide attempt.

summary of the 18 studies in which researchers specifically examined whether NSSI was a risk factor for suicidal behavior (see Table 1). Second, we review an additional 13 studies in which researchers compared a group of individuals engaging in NSSI to a group of individuals engaging in suicidal behavior on several psychosocial indices (see Table 2). Five studies included an examination of NSSI as a risk factor for suicidal behavior, and compared groups with varying self-harm histories, and thus appear in both Tables 1 and 2.

Consistently across studies, it was found that NSSI was a robust predictor of suicidal thoughts and behaviors (Andover & Gibb, 2010; Asarnow et al., 2011; Brunner et al., 2007; Darke et al., 2010; Favaro et al., 2008; Garrison et al., 1993; Lloyd-Richardson, Perrine, Dierker, & Kelley, 2007; Nock et al., 2006; Schwartz, Cohen, Hoffmann, & Meeks, 1989; Tang et al., 2011; Whitlock & Knox, 2007; Whitlock et al., 2008; Zlotnick, Donaldson, Spirito, & Pearlstein, 1997) and that individuals who engaged in NSSI were significantly more likely to report higher levels of suicidal ideation and to have made a suicide attempt as compared to individuals who did not engage in NSSI (Claes et al., 2010; Glenn & Klonsky, 2009; Wilcox et al., 2011). It is important to note that the link between the NSSI and suicidal behavior was maintained after statistically controlling for participant age, gender, ethnicity, and SES (Asarnow et al., 2011; Darke et al., 2010; Garrison et al., 1993; Tang et al., 2011; Wilkinson, Kelvin, Roberts, Dubicka, & Goodyear, 2011). Moreover, NSSI predicted suicidal behavior over and above participant depression (Andover & Gibb, 2010; Asarnow et al., 2011; Tang et al., 2011), hopelessness (Andover & Gibb, 2010; Wilkinson et al., 2011), family functioning (Wilkinson et al., 2011), borderline personality disorder characteristics (Andover & Gibb, 2010) post-traumatic stress, and a history of child abuse (Asarnow et al., 2011; Whitlock et al., 2008).

In several studies, it was also found that more frequent engagement in NSSI (i.e., higher number of NSSI incidents) was predictive of more frequent suicidal attempts (Andover & Gibb, 2010; Brunner et al., 2007; Darke et al., 2010; Prinstein et al., 2008; Schwartz et al., 1989), suggesting that individuals who engage in NSSI more often report more prior suicidal attempts than individuals who engage in NSSI infrequently. Nock et al. (2006), however, did not find that NSSI frequency predicted the frequency of suicidal attempts, and Whitlock and Knox (2007) found that the link between frequency of NSSI was predictive of the frequency of suicidal attempts, but only up to about 50 NSSI incidents (Whitlock & Knox, 2007).

Importantly, NSSI was also found to predict suicidal behavior longitudinally (Asarnow et al., 2011; Prinstein et al., 2008; Wilkinson et al., 2011). More specifically, in two studies involving adolescents receiving treatment for depression, baseline NSSI was predictive of suicidal attempts at 24 and 28 weeks follow-up after controlling for suicidal attempts at baseline (Asarnow et al., 2011; Wilkinson et al., 2011). It is interesting to note, however, that in both studies a history of suicidal attempts at baseline was not predictive of NSSI at 24 and 28 weeks follow-up, suggesting that NSSI may be a more important

predictor of future suicidal behavior than is suicidal behavior a predictor of NSSI (Asarnow et al., 2011). In another longitudinal study, Prinstein et al. (2008) found that among inpatient adolescents, NSSI frequency at treatment onset was associated with greater suicidal ideation at treatment onset and predicted lower suicidal ideation remission rates following treatment.

It is also interesting that regardless of the NSSI assessment method employed by researchers (e.g., one-item self-report, self-report checklist measures, interviews), NSSI was found to predict suicidal behavior (Andover & Gibb, 2010; Favaro et al., 2008; Glenn & Klonsky, 2009; Lloyd-Richardson et al., 2007; Nock et al., 2006). Although assessments involving only one item (i.e., Have you ever tried to harm yourself, without trying to kill yourself?) that require participants to indicate yes/no to whether they have intentionally harmed themselves without lethal intent (e.g., Bebbington et al., 2010) yield lower estimates of NSSI prevalence than do NSSI checklist measures (e.g., ISAS, Klonsky & Glenn, 2009) (Heath et al., 2008), researchers employing one-item measures or checklist assessments have found significant associations between NSSI and suicidal behavior (Andover & Gibb, 2010; Favaro et al., 2008; Glenn & Klonsky, 2009; Nock et al., 2006). Overall, therefore, when NSSI is conceptualized as directly self-injurious behavior absent of any lethal intent, NSSI is associated with suicidal behavior across various assessment methods.

The strength of the association between NSSI and suicidal behavior, however, may depend on the types of NSSI behaviors assessed by researchers. Various behaviors have been considered as NSSI, including self-cutting, head banging, burning, scratching to the point of bleeding, interfering with wound healing, skin picking, severe nail biting, self-hitting, and hair pulling (Heath et al., 2008; Nock, 2010; Tang et al., 2011; Whitlock et al., 2008). Some manifestations of NSSI, however, are more moderate in injury (e.g., hair pulling), whereas other NSSI behaviors cause more severe injury (e.g., self-cutting). In three studies, researchers distinguished moderate forms of NSSI (e.g., pulling hair, biting self) from severe forms of NSSI (e.g., self-cutting, carving, burning) when testing the association between NSSI and suicidal behavior (Favaro et al., 2008; Lloyd-Richardson et al., 2007; Tang et al., 2011). Although researchers found that both moderate and severe forms of NSSI predicted suicidal behavior, the association between NSSI and suicidal behavior was stronger among individuals engaging in more severe forms of NSSI (Favaro et al., 2008; Lloyd-Richardson et al., 2007; Tang et al., 2011). For example, young adults who engaged in moderate NSSI were two times more likely to attempt suicide than individuals who did not engage in any NSSI, but individuals who engaged in severe NSSI were ten times more likely to attempt suicide than individuals who did not engage in NSSI (Tang et al., 2011). Across studies then, NSSI was predictive of suicidal behavior, regardless of whether NSSI was moderate or severe, but risk for suicidal attempt was greater among individuals engaging in severe forms of self-injury such as self-cutting, carving, and burning (Favaro et al., 2008; Lloyd-Richardson et al., 2007; Tang et al., 2011; Whitlock et al., 2008).

Table 2
Summary of studies on risk factors among self-injury groups.

Study	Sample	Assessment of self-injury	Groups compared	Results
Andover and Gibb (2010) ^a	117 inpatient adults with suicide attempt Mage = 39.45	Suicide Behavior Questionnaire (SBQ) Suicidal Intent Questionnaire (SIQ)	SA only: 35% NSSI + SA: 65%	SA + NSSI group reported significantly higher levels of lethality than SA only group.
Asarnow et al. (2011) ^b	327 depressed adolescents Mage = 15.9	Schedule for Affective Disorders and Schizophrenia for School-Aged Children—Present and Lifetime Versions (K-SADS-PL)	Control: 52.6% NSSI only: 23.9% SA only: 9.5% NSSI + SA: 14%	NSSI + SA and NSSI only groups greater depression, suicidal ideation, and hopelessness than control group. NSSI + SA also reported greater family conflict and physical abuse than the NSSI only and SA only groups. NSSI + SA also reported greater depression than SA only. NSSI only and SA only groups did not significantly differ.
Baetens et al. (2011) ^a	1582 adolescents in high school Mage = 15.13	Child and Adolescent Self Harm in Europe (CASE) Questionnaire	NSSI only: 13.7% SA: 3.9%	SA group reported more stressful life events and reported more help-seeking behavior than NSSI only group.
Brausch and Gutierrez (2010) ^a	373 adolescents in high school Mage = 15.13	Self Harm Behavior Questionnaire (SHBQ) Suicidal Ideation Questionnaire (SIQ)	Control: 78.6% NSSI only: 17.1% NSSI + SA: 4%	NSSI + SA reported lower self-esteem, lower parental support, higher anhedonia, more negative self-evaluations and suicidal ideation than NSSI only group (though both groups were at greater risk than the control group). No differences between NSSI + SA and NSSI only in peer support, body satisfactory and disordered eating.
Claes et al. (2010) ^a	128 inpatient adults Mage = 35.62	Self-Injury Questionnaire—Treatment Related (SIQ-TR) Suicidal Ideation Scale (SIS)	Control: 45% NSSI only: 20.3% SA only: 18% NSSI + SA: 16.4%	NSSI + SA and SA only reported higher depression, more depressive reactions, hopelessness, suicidal ideation, lower extraversion than control and NSSI only. NSSI + SA also reported higher neuroticism than NSSI only, SA only, and the control group. NSSI and SA reported lower extraversion than the control group. NSSI + SA and NSSI only reported lower conscientiousness, more avoidance behavior, less social support seeking than SA only or control GROUPS.
Csorba et al. (2009) ^a	105 outpatient adolescents with history of self-injury Mage = 16.64	Ottawa/Queen's Self-Injury Questionnaire (OSI, 33) Mini International Neuropsychiatric Interview (M.I.N.I. Plus)	NSSI only: 56% SA: 44%	SA group reported more depression than NSSI group, though groups didn't differ on anxiety and conduct disorder.
Dougherty et al. (2009) ^b	56 inpatient adolescents with history of self-injury Mage = 15	Lifetime Parasuicide History (LPC-2)	NSSI only: 55% NSSI + SA: 45%	NSSI + SA reported greater depression, hopelessness, self-reported impulsivity and suicidal ideation than NSSI only, but groups did not differ in reported aggression. NSSI + SA also reported more behavioral impulsivity on two reward tasks. These results were maintained after 4–6 weeks following discharge from the inpatient unit.
Guertin et al. (2001) ^a	95 adolescents presenting to hospital following SA Mage = 15.1	Functional Assessment of Self Mutilation (FASM) Suicidal Intent Scale	SA only: 55% NSSI + SA: 45%	NSSI + SA group reported more ODD, MDD, depression, loneliness, anger, risk-taking and reckless behaviors than SA only. Groups did not differ on alcohol use, substance use, CD and family functioning.
Jacobson et al. (2008) ^a	227 outpatient adolescents Mage = 15.08	Lifetime Parasuicide Count (LPC) Suicidal Ideation Questionnaire (SIQ)	Control: 52% NSSI only: 13% SA only: 16% NSSI + SA: 17%	NSSI + SA and SA only reported more MDD, PTSD and suicidality than NSSI and control group (NSSI + SA and SA groups did not differ). NSSI + SA, SA only group, and NSSI only group reported more BPD than the control group. Substance use did not differ amongst groups.
Larson and Sund (2008) ^b	2360 adolescents in high school Mage = 14.9	Intentional self-injury without suicidal intent "Have you ever attempted suicide?"	NSSI only: 2.9% SA: 3.0%	SA group reported greater internalizing (anxiety, depression), suicidal ideation and externalizing behaviors (delinquency) than NSSI only group.
Lloyd-Richardson et al. (2007) ^a	633 students in high school Mage = 15.05	Functional Assessment of Self Mutilation (FASM) Suicidal Ideation Questionnaire (SIQ)	Control: 56% NSSI only: 42% NSSI + SA: 4%	NSSI + SA more likely to have received inpatient treatment, greater suicidal ideation, greater frequency of NSSI, more severe NSSI, and more methods than NSSI only. Both groups reported greater suicidal ideation than control group.
Maddock, Carter, Murrell, Lewin & Conrad (2011) ^a	70 female adult outpatients with BPD and self-injury Mage = 15.08	Parasuicide History Interview (PHI)	NSSI event: 63% SA event: 37%	Individuals whose most recent self-injury event was NSSI reported less help-seeking after injury than SA group. NSSI and SA groups did not differ on BPD, psychiatric co-morbidity, mood disorder, substance use, or impulsivity.
Muehlenkamp et al. (2011) ^a	441 outpatient adolescents Mage = 14.9	Lifetime Parasuicide Count (LPC)	NSSI only: 14% SA only: 18% NSSI + SA: 19%	NSSI + SA group reported more BPD symptoms than SA and NSSI only groups. Increased prevalence of BPD symptoms from NSSI group, to SA group, to NSSI + SA group.
Muehlenkamp and Gutierrez (2004) ^a	390 adolescents in high school Mage = 16.27	Self-Harmful Behavior Questionnaire (SHBQ) Suicidal Ideation Questionnaire (SIQ)	Control: 78.5% NSSI only: 15.9% SA: 5.6%	The SA group and the NSSI group reported more depressive symptoms, suicidality, and attitudes toward death (more attraction to death, more repulsion to life) than control. The SA group also reported significantly more positive attitudes toward death than the NSSI group.

(continued on next page)

Table 2 (continued)

Study	Sample	Assessment of self-injury	Groups compared	Results
Muehlenkamp and Gutierrez (2007) ^a	540 adolescents in highschool Mage = 15.53	Self-Harmful Behavior Questionnaire (SHBQ) Suicidal Ideation Questionnaire (SIQ)	Control: 75.2% NSSI only: 16.1% SA only: 1.9% NSSI + SA: 7%	NSSI + SA group reported greater suicidal ideation, fewer reasons for living, slightly higher depressive symptoms (on negative self evaluations and anhedonia) than NSSI group (SA group did not differ from NSSI + SA group). NSSI + SA also reported less fear about engaging in suicidal behavior than NSSI group. The NSSI + SA group did not report more NSSI incidents than NSSI only group. The control group was at lowest risk.
Ougrin et al. (2011) ^a	70 adolescents clinically referred with self-injury Mage = 15.60	The Columbia Classification Algorithm of Suicide Assessment	NSSI event: 67% SA event: 32%	Individual whose most recent self-injury event was NSSI reported starting self-injury at a significantly earlier age.
Stanley et al. (2001) ^a	53 inpatient adults with prior suicide attempt Mage = 29.9	Schedule for Interviewing Borderlines	SA only: 43% NSSI + SA: 57%	NSSI + SA reported more aggression, more physical punishment in childhood, greater anxiety, more somatic complaints, hopelessness, and BPD than SA only group. NSSI + SA were also more assured of their competency to complete suicidal act. Groups did not differ in number of psychiatric hospitalizations, physical abuse or psychotherapy received.
Whitlock and Knox (2007) ^a	2875 young adults in university (51% less than 20, 49% 20–24)	Checklist of NSSI behaviors Suicide—ideation, plan, gesture and attempt	Control: 75% NSSI only: 10.2% SB only: 7.9% NSSI + SB: 6.9%	NSSI + SB and SB only groups reported greater abuse (emotional, sexual), less attraction to life, more disordered eating, and less help-seeking compared to the NSSI only group. The NSSI only group reported more positive attitudes toward life and were younger than the SB only group. The control group was at least risk.

Note: SA = suicidal attempt and SB = suicidal behaviors.

^a Cross-sectional.

^b Longitudinal.

In summary, regardless of participant age, sex and SES, as well as the methods employed to assess self-injurious behaviors, individuals who engaged in NSSI were at greater risk for suicidal behavior as compared to individuals without a history of NSSI (Asarnow et al., 2011; Darke et al., 2010; Garrison et al., 1993; Tang et al., 2011; Wilkinson et al., 2011). Although the studies reviewed offer compelling evidence that NSSI and suicidal behavior are robustly linked in both adolescent and adult samples, only three of the studies reviewed were longitudinal in nature (Asarnow et al., 2011; Prinstein et al., 2008; Wilkinson et al., 2011). Cross-sectional findings preclude any conclusions about the directionality of the link between NSSI and suicidal behavior, so it may be that individuals who engage in suicidal behavior are at increased risk for NSSI rather than that individuals who engage in NSSI are at increased risk for suicidal behavior. Only by way of longitudinal designs can researchers test the temporal order of NSSI and suicidal behavior over time, and examine the direction of the link between NSSI and suicidal behavior. In support of the notion that NSSI may be a risk factor for suicidal behavior, however, the three longitudinal studies reviewed indicated that NSSI was a significant and unidirectional longitudinal predictor of suicidal behavior (Asarnow et al., 2011; Prinstein et al., 2008; Wilkinson et al., 2011). These studies focused on adolescents receiving outpatient or inpatient treatment, however, and therefore results may not generalize to adolescents in the community or adult populations. Moreover these studies included only brief periods of time between assessment points (e.g., 24 weeks follow-up). Clearly then, additional research on the link between NSSI and suicidal behavior and the direction of the association between these two self-injurious behaviors among adolescents and adults is warranted.

8. Research on NSSI and suicidal behaviors

Although many researchers have concluded that NSSI is a risk factor for suicidal behavior (Andover & Gibb, 2010; Lloyd-Richardson et al., 2007; Nock et al., 2006; Tang et al., 2011; Whitlock & Knox, 2007; Whitlock et al., 2008), few studies have examined which risk factors differentiate individuals who engage in NSSI from individuals who engage in suicidal behavior. Several studies have identified shared risk factors for NSSI and suicidal behavior, including depression and borderline personality disorder (BPD) (Favazza, 1998; Gould, Greenberg, Velting, & Shaffer, 2003; Langbehn & Pfohl, 1993; Nock et al., 2006), physical or

sexual abuse (Muehlenkamp, Kerr, et al., 2010), externalizing behaviors (Hukkanen, Sourander, & Bergroth, 2003; Nock et al., 2006), impulsivity (Lynam, Miller, Miller, Bornovalova, & Lejuez, 2011) and problems in the family (Connor & Rueter, 2006; Tulloch, Blizzard, & Pinkus, 1997). By grouping self-injurious behaviors, however, it becomes difficult to determine which individuals amongst these high risk groups are most likely to engage in suicidal behaviors (Muehlenkamp & Gutierrez, 2007) and the conditions under which NSSI may increase risk for suicidal behaviors are unclear. Identifying when youth are at risk to engage in suicidal behavior, in particular, is of critical importance to clinicians, particularly in the areas of risk assessment and intervention (Brausch & Gutierrez, 2010; Muehlenkamp & Gutierrez, 2007).

Of the 31 studies reviewed, there were 18 studies in which researchers compared groups of individuals with varying histories of self-injurious behaviors across several psychosocial risk factors (see Table 2). First, we review findings from studies in which a group of individuals who engaged in both NSSI and suicidal behavior were compared to a group of individuals who engaged in NSSI but not suicidal behavior. Second, we review findings from studies in which a group of individuals who engaged in both NSSI and suicidal behavior were compared to a group of individuals who engaged in suicidal behavior but not NSSI. Third and finally, we review studies in which researchers compared a group of individuals who engaged in NSSI but not suicidal behavior to a group of individuals who engaged in suicidal behavior but not NSSI.

When we examined studies in which researchers compared individuals who engaged in both NSSI and suicidal behaviors to individuals who engaged in NSSI but not suicidal behavior, we found that individuals who engaged in both NSSI and suicidal behavior tended to be at greater risk, as indexed by more severe symptoms of psychopathology and greater psychosocial impairment, than individuals who engaged only in NSSI (Asarnow et al., 2011; Brausch & Gutierrez, 2010; Claes et al., 2010; Csorba, Dinya, Plener, Nagy, & Pali, 2009; Dougherty et al., 2009; Jacobson et al., 2008; Lloyd-Richardson et al., 2007; Muehlenkamp, Ertelt, Miller, & Claes, 2011; Muehlenkamp & Gutierrez, 2007; Whitlock & Knox, 2007). In two studies of high school adolescents, youth with a history of NSSI and at least one prior suicidal attempt reported more severe anhedonia and negative self-evaluations as compared to youth with a history of only NSSI (Brausch & Gutierrez, 2010; Muehlenkamp & Gutierrez, 2007). Inpatient adolescents who

engaged in NSSI and had attempted suicide reported greater depression, hopelessness and impulsivity on both self-report and performance-based tasks (Dougherty et al., 2009), greater family conflict (Asarnow et al., 2011) and were more likely to have a diagnosis of major depressive disorder (MDD) or post-traumatic stress disorder (PTSD) (Jacobson et al., 2008) than adolescents and adults who engaged in NSSI alone. Although no differences were found between self-harm groups on levels of peer support (Brausch & Gutierrez, 2010), substance use (Jacobson et al., 2008) and aggression (Dougherty et al., 2009), adolescents who engaged in NSSI and had attempted suicide reported significantly higher levels of suicidal ideation (Brausch & Gutierrez, 2010; Dougherty et al., 2009; Jacobson et al., 2008; Muehlenkamp & Gutierrez, 2007), and expressed fewer reasons for living (Muehlenkamp & Gutierrez, 2007) as compared to youth who engaged in only NSSI. Only one study did not find a significant difference between the self-harm groups among adolescents on measures of depression and hopelessness, but the study sample consisted of clinically depressed adolescents, so it is not surprising that both groups were high across these risk factors (Asarnow et al., 2011).

Adults with a history of both NSSI and suicidal behavior also reported greater psychopathology and psychological impairment than adults who engaged in only NSSI. In a large-scale study of university students, Whitlock and Knox (2007) found that young adults who engaged in NSSI and had attempted suicide reported significantly greater psychological distress and trauma (i.e., disordered eating, abuse histories), and were less likely to seek out treatment than individuals with a history of only NSSI. Moreover, Claes et al. (2010) found that inpatient adults who engaged in NSSI and attempted suicide reported significantly greater depression, hopelessness, suicidal ideation and lower extraversion than individuals who engaged in only NSSI. Overall then, individuals who engage in both NSSI and suicidal behavior report higher levels of maladjustment as compared to individuals who engage in NSSI only, suggesting that these individuals may be a more severe clinical group (Andover & Gibb, 2010).

Although we were primarily interested in the research in which individuals who engaged in NSSI and attempted suicide were compared to individuals who engaged in only NSSI, we also identified several studies that included comparisons between individuals who had engaged in NSSI and suicidal behavior and individuals who engaged only in suicidal behavior. In some of the studies reviewed, individuals who engaged in both NSSI and suicidal behavior were at greater risk for psychopathology and psychosocial impairment than individuals who engaged in only suicidal behavior. For example, in three studies of inpatient adults, it was found that adults who engaged in NSSI and attempted suicide were more likely to perceive that their suicidal attempts would be lethal (Andover & Gibb, 2010), reported greater courage and competency to carry out a suicidal attempt (Stanley et al., 2001), and reported higher levels of aggression, anxiety, hopelessness, physical punishment (Stanley et al., 2001) and neuroticism (Claes et al., 2010), as compared to individuals who had attempted suicide but did not engage in NSSI. Similarly, youth suicide attempters who engaged in NSSI reported more depressed symptoms, hopelessness, internalized anger, risky behaviors, loneliness (Guertin et al., 2001), and less fear of suicidal behavior (Muehlenkamp & Gutierrez, 2007) than youth suicide attempters without histories of NSSI. In addition, in a study of depressed adolescents, youth who engaged in NSSI and had made a suicide attempt, reported greater family conflict (Asarnow et al., 2011) and more experiences of physical abuse (Asarnow et al., 2011) than adolescents who attempted suicide but did not engage in NSSI.

It is interesting to note, however, that there were also studies in which researchers found that individuals who engaged in NSSI and suicidal behavior did not report significantly greater symptoms of psychopathology than individuals who engaged in suicidal behavior but not NSSI (Asarnow et al., 2011; Claes et al., 2010; Jacobson et al., 2008; Muehlenkamp & Gutierrez, 2007). For example, in a study of

high school adolescents, Muehlenkamp and Gutierrez (2007) found that individuals who engaged in NSSI and had attempted suicide did not report significantly higher levels of depression, or suicidal ideation than individuals who had attempted suicide but did not engage in NSSI. Similarly, in a study of inpatient adults, suicidal attempters who engaged in NSSI reported comparable rates of depression, hopelessness, and suicidal ideation as compared to suicidal attempters with no history of NSSI (Claes et al., 2010). It may be, then, that individuals who have made at least one suicide attempt are similarly at high risk, regardless of whether or not they report a history of NSSI behaviors.

Finally, we also reviewed studies in which researchers compared individuals with a history of suicidal behavior, but not NSSI (i.e., suicidal behavior only), to a group of individuals with a history of NSSI but not suicidal behavior (i.e., NSSI only). We found that compared to individuals who engaged in NSSI, individuals who engaged in suicidal behavior tended to report more severe symptoms of psychopathology and psychosocial impairment (Claes et al., 2010; Jacobson et al., 2008; Muehlenkamp et al., 2011; Whitlock & Knox, 2007). For example, in a study of outpatient adolescents, suicidal attempters who did not engage in NSSI were more likely to have a diagnosis of MDD or PTSD than adolescents who engaged in NSSI only (Jacobson et al., 2008), though the groups did not differ in BPD characteristics (Jacobson et al., 2008; Muehlenkamp et al., 2011). In a study of young adults, suicidal attempters reported greater childhood abuse, less attraction to life, and more disordered eating than individuals who engaged in NSSI (Whitlock & Knox, 2007). Similarly, Claes et al. (2010) found that adult suicidal attempters reported greater depression, depressive reactions, hopelessness and suicidal ideation than individuals who engaged in NSSI.

There were only two studies in which significant differences were not found between individuals engaging in NSSI and individuals engaging in suicidal behavior. Specifically, Asarnow et al. (2011) found that adolescents who engaged in NSSI did not significantly differ from adolescents who engaged in suicidal behavior on measures of depression and hopelessness; however, their study included only depressed adolescents, so it is not surprising that the self-harm groups did not differ. Muehlenkamp and Gutierrez (2007) also found that adolescents who engaged in NSSI did not significantly differ from adolescents who had attempted suicide on measures of depression, but their group of suicidal attempters was very small ($n = 10$). The authors concluded, therefore, that the small sample size may have contributed to the lack of significant findings between groups.

We also identified four studies that included comparisons between individuals who engaged in NSSI only, and individuals who had made a least one prior suicidal attempt with unknown NSSI histories (i.e., participants may or may not have previously engaged in NSSI). Across studies, it was found that individuals who had made a prior suicidal attempt reported more depression (Csorba et al., 2009; Larson & Sund, 2008), stressful life events (Baetens et al., 2011), and more help-seeking following previous self-injurious behavior (Baetens et al., 2011; Maddock et al., 2011), and were reported to have started self-injuring at a later age (Ougrin et al., 2011) than individuals engaged in NSSI only.

Overall then, adolescents and adults who reported both a history of NSSI and suicidal behavior appeared to be at higher risk for psychopathology and psychosocial impairment than individuals who engaged in suicidal behavior only or NSSI only (Asarnow et al., 2011; Brausch & Gutierrez, 2010; Claes et al., 2010; Csorba et al., 2009; Dougherty et al., 2009; Guertin et al., 2001; Jacobson et al., 2008; Whitlock & Knox, 2007), suggesting that individuals who engage in multiple forms of self-harm may represent a more severe clinical group (Andover & Gibb, 2010). In addition, individuals who engaged in suicidal behavior only were at greater risk across psychosocial indices as compared to individuals who engaged in NSSI alone (Claes et al., 2010; Jacobson et al., 2008; Muehlenkamp et al., 2011; Whitlock & Knox, 2007), which is consistent with the idea that individuals who attempt suicide are

experiencing greater psychological distress as compared to individuals who engage in NSSI. It is interesting to note that the vast majority of studies that we reviewed did not find significant differences in age, sex, ethnic background, or SES among self-harm groups (i.e., NSSI only, suicidal attempt only, NSSI and suicidal attempt), suggesting that demographic variables did not seem to increase the likelihood of belonging to a particular self-harm group (Asarnow et al., 2011; Baetens et al., 2011; Brausch & Gutierrez, 2010; Claes et al., 2010; Csorba et al., 2009; Dougherty et al., 2009; Jacobson et al., 2008; Lloyd-Richardson et al., 2007; Muehlenkamp & Gutierrez, 2004, 2007; Muehlenkamp et al., 2011; Ougrin et al., 2011).

9. Explaining the link between NSSI and suicidal behavior

Despite increased efforts by researchers in recent years to identify risk factors that differentiate individuals who engage in NSSI from individuals who engage in suicidal behaviors, little attention has been paid to *why* NSSI and suicidal behaviors may be linked. From a theoretical perspective, it is important to consider why NSSI may increase risk for suicidal behaviors for some individuals, and yet not for others. Three theories have been proposed to account for the link between NSSI and suicidal behaviors in previous research. In addition to describing each of the three theories, we also provide an evaluation of the evidence for or against each of the three theories.

9.1. The Gateway Theory

Several researchers have suggested that NSSI and suicidal behavior exist along a continuum of self-harm behaviors, with NSSI at one extreme and completed suicide at the other extreme (Brausch & Gutierrez, 2010; Linehan, 1986; Stanley et al., 1992). According to the proponents of the continuum of self-injury, regardless of the intent of the behavior, NSSI and suicidal behavior share common experiential qualities (Stanley et al., 2001). For example, as Stanley et al. (2001) note, NSSI and suicidal behaviors are both intentional acts causing direct bodily harm to oneself. If NSSI and suicidal behaviors are regarded as existing along a continuum of self-injurious behaviors, one theory is that NSSI precedes the development of suicidal behaviors, because suicidal behaviors stem from escalating NSSI behaviors (i.e., the Gateway Theory). More specifically, NSSI may be a gateway form of self-injury that leads to more extreme forms of self-injury with similar experiential qualities (i.e., suicidal attempts), analogous to the way marijuana is regarded as a gateway drug to more extreme hard drug usage (see Golub & Johnson, 1994; Rebellon & Grundy, 2006).

The Gateway Theory is supported by research findings that NSSI predicts suicidal behavior both cross-sectionally and longitudinally among adolescents and adults (Andover & Gibb, 2010; Asarnow et al., 2011; Darke et al., 2010; Favaro et al., 2008; Nock et al., 2006; Tang et al., 2011; Whitlock et al., 2008; Whitlock & Knox, 2007), as well as findings that the frequency of NSSI is predictive of the frequency and lethality of suicidal attempts (Andover & Gibb, 2010; Darke et al., 2010; Garrison et al., 1993; Prinstein et al., 2008; Schwartz et al., 1989; Whitlock & Knox, 2007). Moreover, findings that NSSI predicts suicidal behavior even after controlling for other risk factors for suicidal behavior, such as depression (Andover & Gibb, 2010; Asarnow et al., 2011; Tang et al., 2011), hopelessness (Andover & Gibb, 2010; Wilkinson et al., 2011), family functioning (Wilkinson et al., 2011), and borderline personality disorder characteristics (Andover & Gibb, 2010), are consistent with Gateway Theory in that there seems to be something unique about NSSI that is contributing to an individual's increased risk for suicidal behavior. Gateway Theory also accounts for the high co-occurrence of NSSI and suicidal behavior (Asarnow et al., 2011; Bebbington et al., 2010; Hilt et al., 2008; Jacobson et al., 2008; Nock et al., 2006; Wilcox et al., 2011), because NSSI and suicidal behaviors are thought to be manifestations of the same form of behavior.

Gateway Theory is also supported by findings that NSSI tends to have an earlier age of onset than suicidal behavior, suggesting that on average, NSSI tends to precede suicidal behavior developmentally (Muehlenkamp & Gutierrez, 2007; Nock et al., 2008; Ougrin et al., 2011). More specifically, the average age of onset is most commonly reported in early adolescence, around the age of 13 years (Glenn & Klonsky, 2009; Heath et al., 2008; Nock, 2010; Nock & Prinstein, 2004; Whitlock & Knox, 2007), whereas the average age of onset for suicidal attempts is around 16 years of age (Nock et al., 2008). It is interesting to note that when Ougrin et al. (2011) divided individuals on the basis of their most recent incident of self-injurious behavior, individuals in the NSSI group reported engaging in self-injury at a significantly earlier age than individuals in the suicidal behavior group. Similarly, Darke et al. (2010) found that age of NSSI onset was significantly earlier than age of first suicidal attempt among a sample of illicit drug users in Australia.

Enthusiasm for Gateway Theory, however, is limited by the paucity of longitudinal research on the association between NSSI and suicidal behaviors. Although NSSI and suicidal behaviors may co-exist, proponents of Gateway Theory would predict that the onset of suicidal behaviors would be preceded by increasingly severe NSSI behaviors, a hypothesis that can only be tested using a longitudinal design. Our review yielded only three longitudinal studies (Asarnow et al., 2011; Prinstein et al., 2008; Wilkinson et al., 2011), all of which were limited to adolescents receiving inpatient or outpatient care. Nevertheless, a history of NSSI was found to predict the presence of suicidal behavior, even after controlling for previous suicidal behavior (Asarnow et al., 2011; Wilkinson et al., 2011), though severity of NSSI was not specifically examined. It is important to note, however, that consistent with Gateway Theory, NSSI was found to be a unidirectional predictor of suicidal behavior, suggesting that NSSI may be a stronger predictor of suicidal behavior than is suicidal behavior a predictor of NSSI (Asarnow et al., 2011; Wilkinson et al., 2011).

9.2. The Third Variable Theory

An alternative theory is that the association between NSSI and suicidal behavior is in fact spurious, and that a third variable accounts for the co-occurrence of NSSI and suicidal behaviors. Interestingly, statistics have shown that 90% of people who die by suicide have a diagnosable psychiatric disorder (Cavanagh, Carson, Sharpe, & Lawrie, 2003), but comparable rates of psychiatric diagnoses (87%) have been reported among inpatient samples of youth engaging in NSSI (Nock et al., 2006). Thus, NSSI may not increase risk for suicidal behavior, but rather, it may be that having a psychiatric disorder such as borderline personality disorder similarly increases risk for both NSSI and suicidal behavior (Jacobson et al., 2008; Nock et al., 2006). An example of another third variable that may similarly increase risk for both NSSI and suicidal behavior is perceived level of psychological distress. Individuals who engage in NSSI and/or suicidal behaviors report greater depression, suicidal ideation, lower self-esteem, and lower parental support than individuals who do not engage in any self-injurious behavior (Brausch & Gutierrez, 2010; Muehlenkamp & Gutierrez, 2007; Whitlock & Knox, 2007). NSSI and suicidal behaviors, therefore, may be correlated because they are both markers of extreme psychological distress. There may also be shared biological factors that predispose individuals to self-injurious behaviors. In a recent meta-analysis, Lin and Tsai (2004) reported that individuals who died by suicide were more likely to carry a gene that reduced serotonin uptake (i.e., s allele for 5-HTT) as compared to a living control group. Serotonin system dysfunction has also been proposed to be a risk factor for NSSI (Sher & Stanley, 2009), though researchers are only beginning to explore this hypothesis (Jacobson & Gould, 2007). There is some evidence that self-injurious behaviors can be reduced through the use of SSRIs in humans and animal studies, suggesting that serotonin may indeed play a role in self-directed violence (Antochi, Stravakaki, & Emery, 2003; Tiefenbacher, Novak, Lutz, & Meyer, 2005). These studies,

however, did not specifically differentiate between self-harm behaviors involving lethal or nonlethal intent.

Although NSSI and suicidal behaviors may share similar risk factors, support for the Third Variable Theory is limited by findings that individuals who engage in suicidal behavior can be differentiated from individuals who engage in NSSI by greater levels of psychosocial risk (Claes et al., 2010; Jacobson et al., 2008; Muehlenkamp et al., 2011; Whitlock & Knox, 2007). For example, in a study of outpatient adolescents, suicidal attempters with no prior history of NSSI were more likely to have a diagnosis of MDD or PTSD than adolescents who engaged in only NSSI (Jacobson et al., 2008). Moreover, research has shown that suicidal attempters without a history of NSSI reported greater childhood abuse, less attraction to life, and more disordered eating than individuals who engaged in only NSSI (Whitlock & Knox, 2007). If the association between NSSI and suicidal behavior resulted from shared risk factors, suicidal behaviors should not be significantly differentiated from NSSI on measures of risk.

Third Variable Theory is also inconsistent with findings that individuals who engage in NSSI are at increased risk for suicidal behavior after controlling for age, gender, and SES (Asarnow et al., 2011; Darke et al., 2010; Garrison et al., 1993; Tang et al., 2011; Wilkinson et al., 2011), as well as other risk factors for suicidal behavior such as depression (Andover & Gibb, 2010; Asarnow et al., 2011; Tang et al., 2011), hopelessness (Andover & Gibb, 2010; Wilkinson et al., 2011), family functioning (Wilkinson et al., 2011), borderline personality disorder characteristics (Andover & Gibb, 2010) post-traumatic stress, and history of child abuse (Asarnow et al., 2011; Whitlock et al., 2008).

9.3. Joiner's Theory of Acquired Capability for Suicide

Joiner's (2005) interpersonal theory of suicide underscores the role of NSSI in the prediction of suicidal behaviors. According to Joiner, to end one's own life, an individual must overcome the fear and pain associated with suicidal behaviors, a propensity he refers to as *acquired capability for suicide*. The act of NSSI, Joiner suggests, is one way individuals may increase their acquired capability for suicide, because NSSI may habituate an individual to the fear and pain associated with suicidal self-harming behaviors. Joiner's theory is similar to Gateway Theory in that NSSI is thought to precede the development of suicidal behaviors; however, the theory differs from Gateway Theory in that NSSI is regarded as one of many behaviors that can increase suicidal behaviors indirectly, through acquired capability for suicide. For example, while NSSI is one way individuals may become desensitized to the fear and pain associated with suicidal behaviors, various other behaviors such as drug and alcohol abuse, or exposure to violence (i.e., combat experiences, witnessing interpersonal violence), may similarly increase an individual's acquired capability for suicidal behavior (Van Orden et al., 2010). Thus, individuals who do not engage in NSSI may nevertheless be at increased risk for suicide if they engage in other painful or provocative experiences that lead to acquired capability for suicide. Another central tenant of Joiner's theory that diverges from Gateway Theory is that NSSI alone is not considered to be sufficient for suicidal behaviors. It is only when NSSI leads to acquired capability for suicide, and when acquired capability is coupled with perceived burdensomeness (i.e., the belief that one is a strain on others) and social isolation (i.e., perceived lack of social connectedness and support) that Joiner's proposed suicidal attempts may result (Joiner, 2005; Van Orden, Witte, Gordon, Bender, & Joiner, 2008; Van Orden et al., 2010). The reason that some individuals who engage in NSSI may not attempt suicide, therefore, is because these individuals may not experience feelings of perceived burdensomeness or social isolation.

In support of Joiner's theory, research indicates that more frequent NSSI is predictive of more lethal suicidal attempts (Andover & Gibb, 2010), and that multiple methods of NSSI, as well as more years spent engaging in NSSI, are predictive of number of suicidal attempts (Nock et al.,

2006). In addition, there has been research to suggest that NSSI may desensitize an individual to the fear associated with taking one's own life (Muehlenkamp & Gutierrez, 2007; Stanley et al., 2001). More specifically, Stanley et al. (2001) found that adolescent suicide attempters with a history of NSSI were more assured of their courage and competency to carry out suicidal acts as compared to adolescent suicidal attempters without NSSI histories. Similarly, Muehlenkamp and Gutierrez (2007) found that adolescents with a history of NSSI and attempted suicide reported less fear about engaging in suicidal behavior than adolescents without a history of NSSI.

Also consistent with Joiner's theory, recent research has revealed that an individual's self-reported engagement in painful or provocative experiences (e.g., combat experience, victim of sexual abuse), is significantly correlated with an individual's self-reported acquired capability for suicide (Anestis, Bagge, Tull, & Joiner, 2011; Bender, Gordon, Bresin, & Joiner, 2011; Van Orden et al., 2008). Individuals who experience painful events (e.g., combat experience), therefore, may become desensitized to the fear and pain associated with taking one's own life. In a recent study, Franklin, Hessel, and Prinstein (2011) specifically isolated NSSI as one form of painful or provocative experience, and found that individuals who engaged in NSSI reported significantly greater levels of acquired capability for suicide as compared to a control group of individuals with no prior engagement in NSSI. Moreover, individuals who engaged in NSSI had also significantly greater pain tolerances, as assessed by a cold compressor task, than individuals who did not engage in NSSI (Franklin et al., 2011). Franklin et al.'s (2011) findings are consistent with work that has shown that individuals who engage in NSSI demonstrate greater pain tolerance and pain thresholds in lab-based tasks as compared to non-injuring control groups (Hooley, Ho, Slater, & Lockshin, 2010), suggesting that NSSI, in particular, may be one way individuals become desensitized to pain. Importantly, individuals who report greater acquired capability for suicide (i.e., greater desensitization to pain) are at increased risk for suicidal attempts (Van Orden et al., 2008).

There are criticisms of Joiner's theory, however, that are important to highlight. More specifically, NSSI and suicidal behavior often involve different means (i.e., cutting vs drug overdose), and habituating to one self-harming behavior may not necessarily habituate an individual to another form of self-harm behavior. For example, in two studies on the link between NSSI and suicidal behaviors, drug overdose was the most common means of suicidal attempt, rather than cutting behaviors, even among individuals with NSSI histories (Andover & Gibb, 2010; Stanley et al., 2001). It is important to note, however, that Joiner suggests that although an individual's tolerance to pain may be method specific, various methods may similarly influence an individual's cognitive appraisal of whether the pain of taking one's own life will be tolerable (Van Orden et al., 2010). It is also interesting that even though drug overdose was the most common method of suicide attempt among inpatient adolescents, Stanley et al. (2001) found that individuals with a history of NSSI were two times more likely than individuals without a history of NSSI to use cutting as a means of suicide.

Although Joiner's theory has received increased empirical support in recent years (Anestis et al., 2011; Bender et al., 2011; Van Orden et al., 2008), researchers have yet to examine the link between NSSI and acquired capability for suicide longitudinally, and cross-sectional findings preclude any inferences about causality (Franklin et al., 2011). One criticism of Joiner's theory is that it may be that individuals who engage in NSSI have high tolerances for pain prior to engagement in NSSI (Franklin et al., 2011), but this hypothesis can only be tested using a longitudinal research design. Interestingly though, Franklin et al. (2011) found that individuals who engaged in NSSI (i.e., the NSSI group) reported greater pain tolerances than individuals without NSSI (i.e., the control group), but the NSSI group did not report significantly more painful and provocative experiences than the control group. If a higher tolerance for pain motivated individuals to engage in painful and provocative experiences, one might expect that individuals who

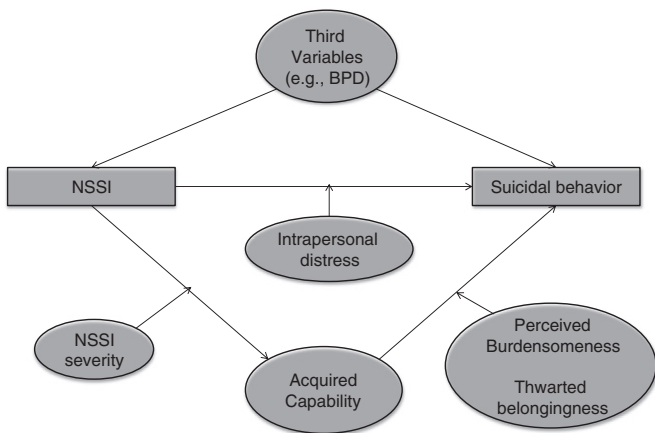


Fig. 1. An integrated model. *Note:* It is predicted that NSSI will directly predict suicidal behavior, as proposed by Gateway Theory, and that this association will be moderated by levels of intrapersonal distress. In line with Third Variable Theory, it is also predicted that shared risk factors (e.g., BPD characteristics) will predict both NSSI and suicidal behavior. Finally, as predicted by Joiner (2005), it is expected that NSSI will predict suicidal behavior indirectly, through acquired capability for suicide. It is also expected that the link between NSSI and acquired capability for suicide will be moderated by NSSI severity, and that the link between acquired capability and suicidal behavior will be moderated by perceived burdensomeness and thwarted belongingness.

engaged in NSSI would report greater engagement in other painful or provocative experiences as compared to the control group (Franklin et al., 2011).

Another criticism of Joiner's (2005) theory is that although research has shown that the number of methods of NSSI, as well as the number of years spent engaging in NSSI, are predictive of the number of suicidal attempts an individual makes, findings regarding the link between frequency of NSSI and number of suicidal attempts have been mixed. Although several researchers have found that more frequent engagement in NSSI is predictive of more frequent suicidal attempts (Andover & Gibb, 2010; Darke et al., 2010; Prinstein et al., 2008; Schwartz et al., 1989), Nock et al. (2006) did not find a significant relation between the frequency of NSSI and frequency of suicidal attempts in their sample of inpatient adolescents. In addition, recall that Whitlock and Knox (2007) found that the link between frequency of NSSI and suicidal behavior was curvilinear, such that the frequency of NSSI was predictive of the frequency of suicidal attempts an individual made, but only up to about 50 NSSI incidents, after which the association decreased (Whitlock & Knox, 2007). Joiner (2005) has stated that once an individual attains the acquired capacity for suicide through habituation to fear and pain, it is likely that an individual will always be at increased risk for suicide. Perhaps then, frequency of NSSI is only predictive of suicide attempts so far as it increases acquired capability for suicide, but once this capability is established, subsequent frequency of NSSI is not as strong a predictor of suicidal behavior as is acquired capability for suicide.

It should also be noted that in one study, Nock et al. (2006) found that more frequent NSSI involving multiple methods (i.e., cutting, head-banging, burning, etc.) predicted *greater* perceived pain during NSSI, which is inconsistent with Joiner's hypothesis that NSSI may habituate an individual to pain over time. It may be, however, that individuals who have become desensitized to the pain during NSSI (i.e., frequent engagers in NSSI), increase the frequency and number of methods used during NSSI to increase painful experiences. Indeed, two commonly endorsed motivations for engaging in NSSI are anti-dissociation (i.e., to reduce feelings of numbness) and feeling generation (i.e., to feel something, even if it is pain) (Klonsky, 2007; Klonsky & Glenn, 2009; Nock & Prinstein, 2004). If NSSI does lead to decreased sensitivity to pain over time, then individuals may have to increase their frequency of engagement in NSSI to produce the desired

experience of pain. On the other hand, it may just be that self-reported pain tolerance is a more inaccurate assessment of pain tolerance as compared to lab-based pain threshold tasks.

10. An integrated model

Although each of the three theories described offer differing explanations for why NSSI and suicidal behaviors may be linked, the existing research on NSSI and suicidal behavior do not clearly support one theory more than the others. It may be that all three theories are relevant to understanding the link between NSSI and suicidal behavior, but researchers have yet to test competing hypotheses about why NSSI and suicidal behavior may be associated. Based on our review of the literature, we propose an integrated model with specific testable predictions about the link between NSSI and suicidal behavior that can serve to inform future research efforts in this area and extend theory development (see Fig. 1).

First, consistent with Gateway Theory, our proposed model includes a direct path from NSSI to suicidal behavior. Given the shared experiential qualities of NSSI and suicidal self-injury (Linehan, 1986; Stanley et al., 1992), we predict that NSSI may uniquely and directly predict suicidal behaviors. In addition, we predict that the direct link between NSSI and suicidal behavior will be moderated by an individual's level of intrapersonal distress. Across all of the studies reviewed, we found that individuals who engaged in NSSI and attempted suicide reported greater levels of depression, hopelessness, and negative self-evaluations as compared to individuals who engaged in only NSSI (Brausch & Gutierrez, 2010; Dougherty et al., 2009; Jacobson et al., 2008; Muehlenkamp & Gutierrez, 2007; Whitlock & Knox, 2007). We expect that the association between NSSI and suicidal behavior, therefore, will be stronger among individuals experiencing high levels of psychological distress.

In line with the Third Variable Theory, the proposed integrated model also includes paths from a latent third variable directly to the variables of NSSI and suicidal behavior. Consistent with the Third Variable Theory, we expect that there will be shared risk factors for NSSI and suicidal behavior that contribute to the high co-occurrence of these two forms of self-injurious behavior. For example, several studies have shown that individuals who engage in NSSI or suicidal behavior report greater BPD characteristics as compared to individuals who do not engage in any self-harm, suggesting BPD may increase risk for both NSSI and suicidal behavior (Jacobson et al., 2008). Unlike the Third Variable Theory, however, we predict that controlling for significant shared predictors of NSSI will not negate the direct link between NSSI and suicidal behavior. Our prediction is based on findings that NSSI predicts suicidal behavior even after controlling for participant age, gender, ethnicity and SES (Asarnow et al., 2011; Darke et al., 2010; Tang et al., 2011; Wilkinson et al., 2011), depression (Andover & Gibb, 2010; Asarnow et al., 2011; Tang et al., 2011), hopelessness (Andover & Gibb, 2010; Wilkinson et al., 2011), family functioning (Wilkinson et al., 2011), borderline personality disorder characteristics (Andover & Gibb, 2010) post-traumatic stress, and history of child abuse (Asarnow et al., 2011; Whitlock et al., 2008).

Lastly, consistent with Joiner's theory, the integrated model also includes an indirect path from NSSI to suicidal behavior, through acquired capability for suicide. We predict, therefore, that acquired capability for suicide will at least partially mediate the link between NSSI and suicidal behavior. It may be that once acquired capability is included as a mediator, NSSI will no longer be a direct predictor of suicidal behavior. Given that research has yet to test the mediational model between NSSI, acquired capability for suicide, and suicidal behavior, at present it is difficult to predict whether acquired capability will fully mediate the link between NSSI and suicidal behavior. We do expect, however, that there will be indirect effects of NSSI on suicidal behavior, through acquired capability. Moreover, we predict that the link between NSSI and acquired capability will be moderated by the degree of NSSI severity, such that there will be a stronger association

between NSSI and acquired capability among individuals engaging in severe forms of NSSI. Our prediction is consistent with findings that individuals who engage in more severe NSSI (e.g., cutting) are at greater risk for suicidal behaviors than individuals who engage in moderate forms of NSSI (e.g., hair pulling) (Favaro et al., 2008; Lloyd-Richardson et al., 2007; Tang et al., 2011). As per Joiner's theory, we also expect that the link between acquired capability for suicide and suicidal behavior will be moderated by suicidal desire (i.e., perceived burdensomeness, thwarted belonging), such that the link between acquired capability for suicide and suicidal behavior will be strongest among individuals reporting high levels of suicidal desire (Van Orden et al., 2008, 2010).

11. Recommendations for future research

Based on the proposed integrated model, we conclude by offering several recommendations for future research, to empirically test predictions about the processes through which NSSI is linked to suicidal behavior. First, researchers should employ large scale longitudinal data designs to provide additional evidence that NSSI is predictive of suicidal behavior over time. Although we identified several studies that indicated that NSSI was a risk factor for suicidal behavior (Andover & Gibb, 2010; Asarnow et al., 2011; Darke et al., 2010; Favaro et al., 2008; Nock et al., 2006; Tang et al., 2011; Whitlock et al., 2008; Whitlock & Knox, 2007), only three of the most recent studies were longitudinal (Asarnow et al., 2011; Prinstein et al., 2008; Wilkinson et al., 2011). Longitudinal findings revealed that NSSI predicted subsequent suicidal attempts even after controlling for a history of suicidal behavior (Asarnow et al., 2011; Wilkinson et al., 2011), but given that these studies were limited to inpatient and outpatient samples of adolescents, findings may not be generalizable to adolescents in the community or adults. Clearly, more longitudinal research is necessary.

Future longitudinal research should also specifically test the proposed mediational link between NSSI, acquired capability for suicide, and suicidal behavior. Several studies have shown that NSSI predicts suicidal behavior (i.e., the main effect) (Andover & Gibb, 2010; Asarnow et al., 2011; Darke et al., 2010; Favaro et al., 2008; Nock et al., 2006; Tang et al., 2011; Whitlock et al., 2008; Whitlock & Knox, 2007), that NSSI predicts acquired capability for suicide (Bender et al., 2011; Franklin et al., 2011; Van Orden et al., 2008), and that acquired capability for suicide predicts suicidal behavior (Van Orden et al., 2008). No study, however, has examined whether the link between NSSI and suicidal behavior remains significant, after controlling for acquired capability for suicide. If the link between NSSI and suicidal behaviors is entirely mediated by acquired capability for suicide, it may suggest that NSSI is predictive of suicidal behavior primarily because NSSI desensitizes an individual to the fear and pain associated with suicidal self-harm. In contrast, if the NSSI and suicidal behavior link is only partially mediated by acquired capability for suicide, then there may be something unique about NSSI that increases risk for suicidal behavior, as suggested by Gateway Theory (Brausch & Gutierrez, 2010; Linehan, 1986; Stanley et al., 1992).

If NSSI is found to be a unique predictor of suicidal behaviors over time even after taking into account an individual's acquired capability for suicide, an important question for future research will be to identify the conditions under which NSSI behaviors may escalate into suicidal behaviors. Several researchers have concluded that NSSI is a form of coping behavior, on the basis of research that individuals report engaging in NSSI to regulate their affective and social experiences (Klonsky & Glenn, 2009; Nock & Prinstein, 2005). One hypothesis is if engaging in NSSI no longer effectively regulates increasingly stressful conditions (i.e., NSSI fails as an effective coping strategy), individuals may start to engage in more extreme forms of self-injury sharing similar experiential qualities (i.e., direct self-inflicted harm), such as suicidal behaviors (Whitlock & Knox, 2007). This hypothesis is supported by findings that individuals who engage in NSSI and attempt suicide report greater

psychological distress than individuals who engage in NSSI alone (Brausch & Gutierrez, 2010; Jacobson et al., 2008; Muehlenkamp & Gutierrez, 2007; Whitlock & Knox, 2007). Most importantly, identifying the point at which an individual's intention changes from non-lethal (i.e., NSSI) to lethal (i.e., suicidal behaviors) should be at the forefront of research efforts, as this may be a critical point for intervention.

It is important to note that the intent of the individual engaging in the self-injurious act has been assessed primarily through self-report (Nock, 2010). Although researchers have noted that it may be possible that an individual may feel ambiguous intent during a given self-harm incident (e.g., nonfatal suicide attempt) (Kleespies et al., 2011; Maddock, Carter, Murrell, Lewin, & Conrad, 2010; Nock et al., 2008), there is consensus that only directly self-injurious behaviors involving zero suicidal intent can be classified as NSSI (Jacobson et al., 2008; Muehlenkamp et al., 2011; Nock, 2010; Ougrin et al., 2011). Identifying other methods to assess an individual's intent may be useful in future research, but it is noteworthy that researchers have shown that using medical severity of an injury to assess an individual's intent may actually underestimate the individual's perceived lethality of intent (Brown et al., 2004; Kleespies et al., 2011). Thus, self-reported intent may be a more accurate predictor of future suicidal behavior (Brown et al., 2004).

Currently, prevention programs aimed at reducing NSSI behaviors are beginning to be piloted and empirically evaluated (e.g., The Signs of Self-Injury Program, SOSI: Jacobs, Walsh, McDade, & Pigeon, 2009; Muehlenkamp, Walsh, & McDade, 2010). In addition to assessing whether these programs reduce the prevalence of NSSI behaviors over time, researchers could begin to include the assessment of suicide-related behaviors. If changes in suicidal behaviors accompany decreases in NSSI behaviors over time, further support for the hypothesis of a causal association between NSSI and suicidal behavior would be provided. Moreover, findings such as these could also provide one mechanism through which suicide-related behaviors might be targeted indirectly by prevention programs aimed at NSSI.

Finally, given that both NSSI and suicidal behavior tend to have their onset in adolescence (Gould et al., 2003; Muehlenkamp & Gutierrez, 2007; Nock et al., 2008), studying NSSI and suicidal behaviors during this age period may be especially informative and important. More specifically, researchers could survey youth prior to adolescence, and then again several times during adolescence to examine the timing of onset of NSSI relative to suicidal behavior within individuals. Although research indicates that NSSI tends to have its onset earlier than suicidal behavior (Muehlenkamp & Gutierrez, 2007; Nock et al., 2008; Ougrin et al., 2011), it would be interesting to examine the time between the onset of NSSI and the onset of suicidal behavior among individuals engaging in both forms of self-injurious behavior. It will also be interesting for future research to examine whether an individual who engages in NSSI in adolescence remains at increased risk for suicidal behavior in adulthood. The importance of the recency of engagement in NSSI is not clearly articulated in Gateway Theory, though Joiner (2005) suggests that once an individual develops acquired capability for suicide that individual will always be at increased risk for suicide. Engagement in NSSI in adolescence, therefore, may only be predictive of suicidal behavior in adulthood so far as it is a measure of an individual's acquired capability for suicide.

12. Conclusions

In an effort to examine the link between NSSI and suicidal behavior, we conducted an extensive review of the literature on self-injurious behaviors among adolescents and adults. In addition to summarizing research on the association between NSSI and suicidal behavior, we also reviewed recent findings on risk factors that differentiated individuals who engaged in NSSI from individuals who engaged in suicidal behaviors. Three theories to account for the association between NSSI and suicidal behaviors were reviewed, and

then an evaluation of these three theories using recent research findings was provided. Based on our extensive review, it is evident that additional research is needed to further elucidate the nature of the association between NSSI and suicidal behaviors, as well as to explore the conditions under which NSSI may increase suicidal risk. Our proposed integrated model offers researchers with specific testable hypotheses that can serve to inform future research efforts and extend theory development.

References

- Andover, M. S., & Gibb, B. E. (2010). Nonsuicidal self-injury, attempted suicide, and suicidal intent among psychiatric inpatients. *Psychiatry Research*, *178*, 101–105.
- Andover, M. S., Primack, J. M., Gibb, B. E., & Pepper, C. M. (2010). An examination of non-suicidal self-injury in men: Do men differ from women in basic NSSI characteristics? *Archives of Suicide Research*, *14*, 79–88.
- Anestis, M. D., Bagge, C. L., Tull, M. T., & Joiner, T. E. (2011). Clarifying the role of dysregulation in the interpersonal-psychological theory of suicidal behavior in an undergraduate sample. *Journal of Psychiatric Research*, *45*, 603–611.
- Antochi, R., Stravrakaki, C., & Emery, P. C. (2003). Psychopharmacological treatments in persons with dual diagnosis of psychiatric disorders and developmental disabilities. *Postgraduate Medical Journal*, *79*, 139–146.
- Asarnow, J. R., Porta, G., Spirito, A., Emslie, G., Clarke, G., Wagner, K. D., et al. (2011). Suicide attempts and nonsuicidal self-injury in the treatment of resistant depression in adolescents: Findings from the TORDIA study. *Journal of the American Academy of Child and Adolescent Psychiatry*, *50*, 772–781.
- Baetens, I., Claes, L., Muehlenkamp, J., Grietens, H., & Onghena, P. (2011). Nonsuicidal and suicidal self-injurious behavior among Flemish adolescents: A web-base survey. *Archives of Suicide Research*, *15*, 56–57.
- Bebbington, P. E., Minot, S., Cooper, C., Dennis, M., Meltzer, H., Jenkins, R., et al. (2010). Suicidal ideation, self-harm and attempted suicide: Results from the British psychiatric morbidity survey 2000. *European Psychiatry*, *25*, 427–431.
- Bender, T. W., Gordon, K. H., Breslin, K., & Joiner, T. E., Jr. (2011). Impulsivity and suicidality: The mediating role of painful and provocative experiences. *Journal of Affective Disorders*, *129*, 301–307.
- Boxer, P. (2010). Variations in risk and treatment factors among adolescents engaging in different types of deliberate self-harm in an inpatient sample. *Journal of Clinical Child and Adolescent Psychology*, *39*, 470–480.
- Brausch, A. M., & Gutierrez, P. M. (2010). Differences in non-suicidal self-injury and suicide attempts in adolescents. *Journal of Youth and Adolescence*, *39*, 233–242.
- Briere, J., & Gil, E. (1998). Self-mutilation in clinical and general population samples: Prevalence, correlates, and functions. *The American Journal of Orthopsychiatry*, *68*, 609–620.
- Brown, M. Z., Comtois, K. A., & Linehan (2002). Reasons for suicide attempts and non-suicidal self-injury in women with borderline personality disorder. *Journal of Abnormal Psychology*, *111*, 198–202.
- Brown, G. K., Henriques, G. R., Sosdjan, D., & Beck, A. T. (2004). Suicide intent and accurate expectations of lethality: Predictors of medical lethality of suicide attempts. *Journal of Consulting and Clinical Psychology*, *72*, 1170–1174.
- Brunner, R., Parzer, P., Haffner, J., Steen, R., Roos, J., Klett, M., et al. (2007). Prevalence and psychological correlates of occasional and repetitive deliberate self-harm in adolescents. *Archives of Pediatric Adolescent Medicine*, *7*, 641–649.
- Bureau, J.-F., Martin, J., Freynet, N., Poirier, A. A., Lafontaine, M.-F., & Cloutier, P. (2010). Perceived dimensions of parenting and non-suicidal self-injury in young adults. *Journal of Youth and Adolescence*, *39*, 484–494.
- Cavanagh, J. T., Carson, A. J., Sharpe, M., & Lawrie, S. M. (2003). Psychological autopsy studies of suicide: A systematic review. *Psychological Medicine*, *33*, 395–405.
- Chartrand, H., Sareen, J., Toews, M., & Bolton, J. M. (2011). Suicide attempts versus nonsuicidal self-injury among individuals with anxiety disorders in a nationally representative sample. *Depression and Anxiety*, <http://dx.doi.org/10.1002/da.20882> (Advanced online publication).
- Claes, L., Muehlenkamp, J., Vandereycken, W., Hamelinck, L., Martens, H., & Claes, S. (2010). Comparison of non-suicidal self-injurious behavior and suicide attempts in patients admitted to a psychiatric crisis unit. *Personality and Individual Differences*, *48*, 83–87.
- Connor, J. J., & Rueter, M. A. (2006). Parent-child relationships as a systems of support or risk for adolescent suicidality. *Journal of Family Psychology*, *20*, 143–155.
- Corcoran, P., Reulbach, U., Perry, I. J., & Arensman, E. (2010). Suicide and deliberate self-harm in older Irish adults. *International Psychogeriatrics*, *22*, 1327–1336.
- Csorba, J., Dinya, E., Plener, P., Nagy, E., & Pali, E. (2009). Clinical diagnoses, characteristics of risk behavior, differences between suicidal and non-suicidal subgroups of Hungarian adolescent outpatients practising self-injury. *European Child & Adolescent Psychiatry*, *18*, 309–320.
- Darche, M. A. (1990). Psychological factors differentiating self-mutilating and non self-mutilating adolescent inpatient families. *The Psychiatric Hospital*, *21*, 31–35.
- Darke, S., Torok, M., Kaye, S., & Ross, J. (2010). Attempted suicide, self-harm, and violent victimization among regular illicit drug users. *Suicide & Life-Threatening Behavior*, *40*, 587–596.
- Dougherty, D. D., Mathias, C. W., Marsh-Richard, D. M., Prevette, K. N., Dawes, M. A., Hatzis, E. S., et al. (2009). Impulsivity and clinical symptoms among adolescents with non-suicidal self-injury with or without attempted suicide. *Psychiatry Research*, *169*, 22–27.
- Favaro, A., Santonastaso, P., Monteleone, P., Bellodi, L., Mauri, M., Rotondo, A., et al. (2008). Self-injurious behavior and attempted suicide in purging and bulimia nervosa: Associations with psychiatric comorbidity. *Journal of Affective Disorders*, *105*, 285–289.
- Favazza, A. R. (1998). The coming age of self-mutilation. *The Journal of Nervous and Mental Disease*, *186*, 259–268.
- Favazza, A. R., & Rosenthal, R. J. (1993). Diagnostic issues in self-mutilation. *Hospital & Community Psychiatry*, *44*, 134–140.
- Franklin, J. C., Hessel, E. T., & Prinstein, M. J. (2011). Clarifying the role of pain tolerance in suicidal capability. *Psychiatry Research*, *189*, 362–367.
- Garrison, C. Z., Addy, C. L., McKeown, R. E., Cuffe, S. P., Jackson, K. L., & Waller, J. L. (1993). Nonsuicidal physically self-damaging acts in adolescents. *Journal of Child and Family Studies*, *2*, 339–352.
- Glenn, C. R., & Klonsky, E. D. (2009). Social context during non-suicidal self-injury indicates suicide risk. *Personality and Individual Differences*, *46*, 25–29.
- Golub, A., & Johnson, B. (1994). The shifting of importance of alcohol and marijuana as gateway substances among serious drug abusers. *Journal of Studies on Alcohol*, *55*, 607–614.
- Gould, M. S., Greenberg, T., Velting, D. M., & Shaffer, D. (2003). Youth suicide risk and preventative interventions: A review of the past 10 years. *Journal of the American Academy of Child and Adolescent Psychiatry*, *42*, 386–405.
- Gratz, K. L., Conrad, S. D., & Roemer, L. (2002). Risk factors for deliberate self-harm among college students. *The American Journal of Orthopsychiatry*, *72*, 128–140.
- Guertin, T., Lloyd-Richardson, E., Spirito, A., Donaldson, D., & Boergers, J. (2001). Self-mutilative behavior in adolescents who attempt suicide by overdose. *Journal of the American Academy of Child and Adolescent Psychiatry*, *39*, 470–480.
- Haw, C., Bergen, H., Casey, D., & Hatwon, K. (2007). Repetition of deliberate self-harm: A study of the characteristics and subsequent deaths in patients presenting to a general hospital according to extent of repetition. *Suicide & Life-Threatening Behavior*, *37*, 379–396.
- Hawton, K., & Harriss, L. (2008). How often does deliberate self-harm occur relative to each suicide? A study of variations by gender and age. *Suicide & Life-Threatening Behavior*, *38*, 650–660.
- Heath, N. L., Toste, J. R., & Beettam, E. L. (2007). School counsellors' experiences with self-injury in the schools. Paper presented at the Canadian Academy for Child and Adolescent Psychiatry annual conference, Montreal, Quebec.
- Heath, N. L., Toste, J. R., Nedecheva, T., & Charlebois, A. (2008). An examination of non-suicidal self-injury among college students. *Journal of Mental Health Counselling*, *30*, 137–156.
- Hilt, L. M., Nock, M. K., Lloyd-Richardson, E. E., & Prinstein, M. J. (2008). Longitudinal study of nonsuicidal self-injury among young adolescents: Rates, correlates, and preliminary test of an interpersonal model. *Journal of Early Adolescence*, *28*, 455–469.
- Hooley, J. M., Ho, D. T., Slater, J., & Lockshin, A. (2010). Pain perception and nonsuicidal self-injury: A laboratory investigation. *Personality Disorders, Theory, Research and Treatment*, *1*, 170–179.
- Hukkanen, R., Sourander, A., & Bergroth, L. (2003). Suicidal ideation and behavior in children's homes. *Nordic Journal of Psychiatry*, *57*, 131–137.
- Hunt, I. M., Kapur, N., Webb, R., Robinson, J., Burns, J., Turnbull, P., et al. (2007). Suicide in current psychiatric in-patients: A case-control study. *Psychological Medicine*, *37*, 831–837.
- Jacobs, D., Walsh, B. W., McDade, M., & Pigeon, S. (2009). *Signs of self-injury prevention manual*. Wellesley Hills, MA: Screening for Mental Health.
- Jacobson, C. M., & Gould, M. (2007). The epidemiology and phenomenology of non-suicidal self-injurious behavior among adolescents: A critical review of the literature. *Archives of Suicide Research*, *11*, 129–147.
- Jacobson, C. M., Muehlenkamp, J. J., Miller, A. L., & Turner, J. B. (2008). Psychiatric impairment among adolescents engaging in different types of deliberate self-harm. *Journal of Child and Adolescent Psychology*, *37*, 363–375.
- Joiner, T. (2005). *Why people die by suicide*. Cambridge, MA: Harvard University Press.
- King, E. A., Baldwin, D. S., Sinclair, J. M. A., & Campbell, M. J. (2001). The Wessex recent in-patient suicide study 2: Case-control study of 59 in-patient suicides. *The British Journal of Psychiatry*, *178*, 537–542.
- Kleespies, P. M., AhnAllen, C. G., Knight, J. A., Presskreischer, B., Barrs, K. L., Boyd, B. L., & Dennis, J. P. (2011). A study of self-injurious behaviors and suicidal behavior in a veteran population. *Psychological Services*, *8*, 236–250.
- Klonsky, E. D. (2007). The functions of deliberate self-injury: A review of the evidence. *Clinical Psychology Review*, *27*, 226–239.
- Klonsky, E. D. (2011). Non-suicidal self-injury in United States adults: Prevalence, sociodemographics, topography and functions. *Psychological Medicine*, <http://dx.doi.org/10.1017/S0033291710002497> (Advanced online publication).
- Klonsky, E. D., & Glenn, C. R. (2009). Assessing the functions of non-suicidal self-injury: Psychometric properties of the inventory of statements about self-injury. *Journal of Psychopathology and Behavioural Assessment*, *31*, 215–219.
- Klonsky, E. D., & Olino, T. M. (2008). Identifying clinically distinct subgroups of self-injurers among young adults: A latent class analysis. *Journal of Consulting and Clinical Psychology*, *76*, 22–27.
- Krug, E. G., Dahlberg, L. L., Mercy, J. A., Zwi, A. B., & Lozano, R. (Eds.). (2002). *World report on violence and health*. Geneva: World Health Organization.
- Langbehn, D. R., & Pfohl, B. (1993). Clinical correlates of self-mutilation among psychiatric inpatients. *Annals of Clinical Psychiatry*, *5*, 45–51.
- Larson, B., & Sund, A. M. (2008). Prevalence, course, incidence and 1-year prediction of deliberate self-harm and suicide attempts in early Norwegian school adolescents. *Suicide & Life-Threatening Behavior*, *38*, 152–165.
- Lin, P., & Tsai, G. (2004). Association between serotonin transporter gene promoter polymorphism and suicide: Results of a meta-analysis. *Biological Psychiatry*, *55*, 1023–1030.

- Linehan, M. M. (1986). Suicidal people: One population of two? *Annals New York Academy of Science*, 487, 16–33.
- Lloyd-Richardson, E. E., Perrine, N., Dierker, L., & Kelley, M. L. (2007). Characteristics and functions of non-suicidal self-injury in a community sample of adolescents. *Psychological Medicine*, 37, 1183–1192.
- Lynam, D. R., Miller, J. D., Miller, D. J., Bornovalova, M. A., & Lejuez, C. W. (2011). Testing the relations between impulsivity-related traits, suicidality, and nonsuicidal self-injury: A test of the incremental validity of the UPSS Model. *Personality Disorders: Theory, Research, and Treatment*, 2, 151–160.
- Maddock, G. R., Carter, G. L., Murrell, E. R., Lewin, T. J., & Conrad, A. M. (2010). Distinguishing suicidal from non-suicidal deliberate self-harm events in women with Borderline Personality Disorder. *The Australian and New Zealand Journal of Psychiatry*, 44, 574–582.
- Maddock, G. R., Carter, G. L., Murrell, E. R., Lewin, T. J., & Conrad, A. M. (2011). *Australian and New Zealand Journal of Psychiatry*, 17, 435–446.
- McAuliffe, C., Arensman, E., Keeley, H. S., Corcoran, P., & Fitzgerald, A. P. (2007). Motives and suicide intent underlying hospital treated deliberate self-harm and their association with repetition. *Suicide & Life-Threatening Behavior*, 37(4), 397–408.
- Muehlenkamp, J. J. (2005). Self-injurious behavior as a separate clinical syndrome. *The American Journal of Orthopsychiatry*, 75, 324–333.
- Muehlenkamp, J. J., Ertelt, T. W., Miller, A. L., & Claes, L. (2011). Borderline personality symptoms differentiate non-suicidal and suicidal self-injury in ethnically diverse adolescent outpatients. *Journal of Child Psychology and Psychiatry*, 52, 148–155.
- Muehlenkamp, J. J., & Gutierrez, P. M. (2004). An investigation of differences between self-injurious behavior and suicide attempts in a sample of adolescents. *Suicide & Life-Threatening Behavior*, 34, 12–22.
- Muehlenkamp, J. J., & Gutierrez, P. M. (2007). Risk for suicide attempts among adolescents who engage in non-suicidal self-injury. *Archives of Suicide Research*, 11, 69–82.
- Muehlenkamp, J. J., Kerr, P. L., Bradley, A. R., & Adams, L. M. (2010). Abuse subtypes and nonsuicidal self-injury: Preliminary evidence of complex emotion regulation patterns. *The Journal of Nervous and Mental Disease*, 198, 258–263.
- Muehlenkamp, J. J., Walsh, B. W., & McDade (2010). Preventing nonsuicidal self-injury in adolescents: The signs of self-injury program. *Journal of Youth and Adolescence*, 39, 306–314.
- Nixon, M., Cloutier, P., & Aggarwal, S. (2002). Affect regulation and addictive aspects of repetitive self-injury in hospitalized adolescents. *Journal of the American Academy of Child and Adolescent Psychiatry*, 41, 1333–1341.
- Nock, M. K. (2010). Self-injury. *Annual Review of Clinical Psychology*, 6, 339–363.
- Nock, M. K., Borges, G., Bromet, E. J., Cha, C. B., Kessler, R. C., & Lee, S. (2008). Suicide and suicidal behavior. *Epidemiologic Reviews*, 30, 133–154.
- Nock, M. K., & Favazza, A. (2009). Non-suicidal self-injury: Definition and classifications. In M. K. Nock (Ed.), *Understanding nonsuicidal self-injury: Origins, assessment and treatment*. Washington DC: American Psychological Association.
- Nock, M. K., & Prinstein, M. J. (2005). Contextual features and behavioral functions of self-mutilation among adolescents. *Journal of Abnormal Psychology*, 114, 140–146.
- Nock, M. K., Joiner, E. E., Jr., Gordon, K. H., Lloyd-Richardson, E., & Prinstein, M. J. (2006). Non-suicidal self-injury among adolescents: Diagnostic correlates and relation to suicide attempts. *Psychiatry Research*, 144, 65–72.
- Nock, M. K., & Prinstein, M. J. (2004). A functional approach to the assessment of self-mutilative behavior. *Journal of Consulting and Clinical Psychology*, 72, 885–890.
- Ougrin, D., Zundel, T., Kryiakopoulos, Banarsee, R., Stahl, D., & Taylor, E. (2011, August 22). Adolescents with suicidal and nonsuicidal self-harm: Clinical characteristics and response to therapeutic assessment. *Psychological Assessment*, <http://dx.doi.org/10.1037/a0025043> (Advance online publication).
- Patton, G. C., Harris, R., Carlin, J. B., Hibbert, M. E., Coffey, C., Schwartz, M., et al. (1997). Adolescent suicidal behaviors: A population-based study of risk. *Psychological Medicine*, 27, 715–724.
- Plener, P. L., Libal, G., Keller, F., Fegert, J. M., & Muehlenkamp, J. J. (2009). An international comparison of adolescent non-suicidal self-injury (NSSI) and suicide attempts: Germany and the USA. *Psychological Medicine*, 39, 1549–1558.
- Portzky, G., & van Heeringen, K. (2007). Deliberate self-harm in adolescents. *Current Opinion in Psychiatry*, 20, 227–342.
- Powell, J., Geddes, J., Hawton, K., Deeks, J., & Goldacre, M. (2000). Suicide in psychiatric hospital in-patients: Risk factors and their predictive power. *The British Journal of Psychiatry*, 176, 266–272.
- Prinstein, M. J., Nock, M. K., Simon, V., Aikin, J. W., Cheah, C. S. L., & Spirito, A. (2008). Longitudinal trajectories and predictors of suicidal ideation and attempts following inpatient hospitalization. *Journal of Consulting and Clinical Psychology*, 76, 92–103.
- Rebellon, C. J., & Grundy, K. V. (2006). Can social psychological delinquency theory explain the link between marijuana and other illicit drug use? A longitudinal analysis of the gateway hypothesis. *Journal of Drug Issues*, 36, 515–539.
- Ross, S., & Heath, N. (2002). A study of the frequency of self-mutilation in a community sample of adolescents. *Journal of Youth and Adolescence*, 31, 67–77.
- Schwartz, R. H., Cohen, P., Hoffmann, N. G., & Meeks, J. E. (1989). Self-harm behaviors (carving) in female adolescent drug abusers. *Clinical Pediatrics*, 28, 340–346.
- Sher, L., & Stanley, B. H. (2009). Biological models of nonsuicidal self-injury. In M. K. Nock (Ed.), *Understanding nonsuicidal self-injury: Origins, assessment and treatment*. Washington DC: American Psychological Association.
- Sinclair, J. M. A., Hawton, K., & Gray, A. (2010). Six year follow-up of a clinical sample of self-harm patients. *Journal of Affective Disorders*, 121, 247–252.
- Stanley, B., Gameroff, M. J., Michalsen, V., & Mann, J. J. (2001). Are suicide attempters who self-mutilate a unique population? *The American Journal of Psychiatry*, 158, 427–432.
- Stanley, B., Winchell, R., Molcho, A., Simeon, D., & Stanley, M. (1992). Suicide and the self-harm continuum: Phenomenological and biochemical evidence. *International Review of Psychiatry*, 4, 149–155.
- Stats Canada (2008). Suicide: Guide to the latest information [on-line]. Available: <http://www.statcan.gc.ca/search-recherche/bb/info/3000019-eng.htm>
- Tang, J., Yu, Y., Wu, Y., Du, Y., Ma, Y., Zhu, H., et al. (2011). Association between non-suicidal self-injuries and suicide attempts in Chinese adolescents and college students: A cross-sectional study. *PLoS One*, 6(4), e17977, <http://dx.doi.org/10.1371/journal.pone.0017977>.
- Tiefenbacher, S., Novak, M. A., Lutz, C. K., & Meyer, J. S. (2005). The physiology and neurochemistry of self-injurious behavior: A nonhuman primate model. *Frontiers in Bioscience*, 10, 1–11.
- Tulloch, A. L., Blizard, L., & Pinkus, Z. (1997). Adolescent-parent communication in self-harm. *Journal of Adolescent Health*, 21, 267–275.
- Van Orden, K. A., Witte, T. K., Cukrowicz, K. C., Braithwaite, S. R., Selby, E. A., & Joiner, T. E., Jr. (2010). The interpersonal theory of suicide. *Psychological Review*, 117, 575–600.
- Van Orden, K. A., Witte, T. K., Gordon, K. H., Bender, T. W., & Joiner, T. E., Jr. (2008). Suicidal desire and the capability for suicide: Tests of the interpersonal-psychological theory of suicidal behavior among adults. *Journal of Consulting and Clinical Psychology*, 76, 72–83.
- Whitlock, J., & Knox, K. L. (2007). The relationship between self-injurious behavior and suicide in a young adult population. *Archives of Pediatrics & Adolescent Medicine*, 161, 634–640.
- Whitlock, J., Muehlenkamp, J., & Eckenrode (2008). Variation in nonsuicidal self-injury: Identification and features of latent classes in a college population of emerging adults. *Journal of Clinical Child and Adolescent Psychology*, 37, 725–735.
- Wilcox, H. C., Arria, A. M., Caldeira, K. M., Vincent, K. B., Pinchevsky, G. M., & O'Grady, K. E. (2011). Longitudinal predictors of past-year non-suicidal self-injury and motives among college students. *Psychological Medicine*, <http://dx.doi.org/10.1017/S0032971711001814> (Advance online publication).
- Wilkinson, P., Kelvin, R., Roberts, C., Dubicka, B., & Goodyear, I. (2011). Clinical and psychosocial predictors of suicide attempts and nonsuicidal self-injury in the adolescent depression antidepressants and psychotherapy trial. *The American Journal of Psychiatry*, 168, 495–501.
- Yates, T. M., Tracy, A. J., & Luthar, S. A. (2008). Nonsuicidal self-injury among privileged youths: Longitudinal and cross-sectional approaches to developmental process. *Journal of Consulting and Clinical Psychology*, 76, 52–62.
- Young, R., Sweeting, H., & West, P. (2006). Prevalence of deliberate self harm and attempted suicide within Goth youth subculture: Longitudinal cohort study. *British Medical Journal*, 332, 1058–1061.
- Zlotnick, C., Donaldson, D., Spirito, A., & Pearlstein, M. D. (1997). Affect regulation and suicide attempts in adolescent inpatients. *Journal of the American Academy of Child and Adolescent Psychiatry*, 36, 793–798.
- Zoroglu, S. S., Tuzun, U., Sar, V., Tutkun, H., Savacs, H. A., Ozturk, M., et al. (2003). Suicide attempt and self-mutilation among Turkish high school students in relation with abuse, neglect and dissociation. *Psychiatry and Clinical Neurosciences*, 57, 119–126.