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Non-Suicidal Self-Injury in Swedish Adolescents

Prevalence, Characteristics, Functions and
Associations With Childhood Adversities

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Abstract

Non-suicidal self-injury (NSSI), such as intentionally cutting, burning or hitting oneself, is a behavior with potentially detrimental consequences and empirical studies are necessary to gain knowledge of how to prevent NSSI in adolescents. The aims of this thesis were to investigate the prevalence, methods, characteristics and functions of NSSI in a large community sample of Swedish adolescents, and to examine the relationship between NSSI and adverse life events and trauma symptoms. All empirical studies had a cross-sectional design and were based on 3,097 adolescents in the county of Östergötland, aged 15-17 years, in their first year of high school. Participating school classes were selected through a randomization process and administered self-report questionnaires.

In study I ($n = 3,060$) a single item NSSI question resulted in a prevalence rate of 17.2%, while 35.6% of adolescents reported having engaged in NSSI at least once during the past year when given a checklist. The most commonly reported type of NSSI in this sample was “bit yourself”, followed by “hit yourself on purpose”, “erased your skin” and “cut or carved on your skin”. Applying the proposed DSM-5 diagnostic criteria of NSSI resulted in a prevalence rate of 6.7%. Results in study II ($n = 2,964$) showed that after controlling for gender, parental occupation and living conditions, adolescents with no self-injurious behavior reported the lowest level of adversities and trauma symptoms, while adolescents with both NSSI and suicide attempts (5.7%) reported the highest levels compared to those with only NSSI or a suicide attempt. Adolescents reporting frequent NSSI reported more adversities and trauma symptoms than those with less frequent NSSI. Automatic functions, such as affect regulation, self-punishment and feeling-generation, were the most commonly reported functions of NSSI. Attempts in study I to confirm Nock and Prinstein’s (2004) four-factor model of underlying factors of NSSI functions resulted in a close to acceptable fit. An attempt to refine the factor analysis on this community sample of Swedish adolescents, using Mplus with cross-validation, was made in study III ($n = 836$). An exploratory factor analysis resulted in a three-factor model (social influence, automatic functions and non-conformist peer identification), which was validated in confirmatory analysis. In order to adhere more closely to learning theory and the concept of negative and positive reinforcement, the third factor was then split into two factors, resulting in a four-factor model (social influence, automatic functions, peer identification and avoiding demands), which showed excellent fit to the data in the confirmatory factor analysis. Study IV ($n = 816$) showed that NSSI frequency, gender (female), self-reported experience of emotional and physical abuse, having made a suicide attempt, prolonged illness or handicap and symptoms of depression and dissociation were significant predictors in the final model of the automatic functions, indicating that these variables are important in understanding the mechanisms underlying the need to engage in NSSI to regulate emotions, generate feelings, gain control or to self-punish. Symptoms of depression and dissociation mediated the relationship between sexual, physical and emotional abuse and the automatic functions. Furthermore, frequency of NSSI, gender, emotional abuse, prolonged illness or handicap and symptoms of depression uniquely predicted automatic functions but not social functions. Self-reported experience of physical abuse, having made a suicide attempt, symptoms of anxiety and dissociation were significant in the final model of social functions, i.e., performing NSSI to influence or communicate with others, to avoid demands or to identify with peers. Of these, symptoms of anxiety were uniquely associated with social functions. Symptoms of anxiety and dissociation mediated the relationship between physical abuse and social functions of NSSI.

Taken together, this thesis has shown that NSSI is prevalent in Swedish adolescents and findings contribute to the discussion of a potential NSSI diagnosis. It is important to consider the effect of different types of negative life events and trauma symptoms in relation to NSSI in adolescents. Assessing the specific reinforcing functions of NSSI and the underlying factor structure can be helpful in developing functionally relevant individualized treatment.

Sammanfattning på svenska

Självskadebeteende, t ex att avsiktligt skära, bränna eller slå sig själv är potentiellt skadliga beteenden. Empiriska studier är viktiga för att kunna förebygga självskadebeteende hos ungdomar. Föreliggande avhandling syftar till att undersöka självskadebeteendets förekomst, funktion, karaktäristik och metoder hos svenska ungdomar, samt att undersöka relationen till negativa livshändelser och traumasymptom. Samtliga fyra empiriska studier hade en tvärsnittsdesign och baserades på 3,097 ungdomar i Östergötland, 15-17 år, i gymnasieskolans årskurs 1, vars skolklasser valts ut slumpmässigt och som besvarat självskattningsformulär.

I studie I ($n = 3,060$) angav 17.2%, som svar på en allmän självskadefråga, att de avsiktligt skadat sig under sin livstid. När ungdomarna däremot svarade på en checklista med olika självskadebeteenden, angav 35.6% att de hade ägnat sig åt någon typ av självskadebeteende under det senaste året. De vanligaste metoderna var att avsiktligt bita eller slå sig själv, sudda på huden och att skära sig. De föreslagna diagnoskriterierna för icke-suicidal självskada i DSM-5 resulterade i en förekomst av 6.7%. Studie II ($n = 2,964$) visade att ungdomar utan självskadebeteende rapporterade de lägsta antalet negativa livshändelser och traumasymptom, medan de med erfarenhet av både självskadebeteende och självmordsförsök (5.7%) rapporterade de högsta antalen jämfört med de med endast självskadebeteende eller självmordsförsök. Ungdomar med fler självskadetillfällen rapporterade fler negativa livshändelser och traumasymptom än de med färre tillfällen. Automatiska/intrapersonella funktioner, såsom att generera och reglera känslor samt att straffa sig själv var de vanligaste funktionerna som rapporterades. Försök att konfirmera Nock och Prinsteins (2004) fyrfaktormodell av underliggande funktionsfaktorer i studie I resulterade i en modell med nära acceptabel passform. Ett försök att förbättra faktoranalysen på den aktuella urvalsgruppen gjordes med Mplus i studie III ($n = 836$). En exploratorisk analys resulterade i en trefaktormodell (interpersonell påverkan, automatisk/intrapersonell funktion samt ”icke-konformistisk” kamratidentifikation), vilken även validerades i den konfirmatoriska analysen. Med utgångspunkt i inläringsteori och begreppen negativ och positiv förstärkning delades därefter den tredje faktorn upp i två faktorer. Det resulterade i en fyrfaktormodell (interpersonell påverkan, automatisk/intrapersonell funktion, kamratidentifikation samt undvikande av krav). Fyrfaktormodellen visade utmärkt passform i den konfirmatoriska analysen. Studie IV ($n = 816$) visade att självskadebeteendets frekvens, kön (flicka), självrapporterade erfarenheter av psykisk och fysisk misshandel, självmordsförsök, kronisk sjukdom eller handikapp under uppväxten, liksom symptom på depression och dissociation predicerade automatiska självskadefunktioner. De variablerna är potentiellt viktiga för förståelsen av de mekanismer som är involverade när ungdomar skadar sig själva för att generera och reglera känslor, få kontroll, liksom att straffa sig själva. Relationen mellan psykisk och fysisk misshandel och de automatiska funktionerna medierades av symptom på depression och dissociation. Självskadefrekvens, kön, psykisk misshandel, sjukdom/handikapp och symptom på depression predicerade enbart automatiska men inte sociala funktioner. Självrapporterad fysisk misshandel, självmordsförsök, symptom på ångest och dissociation var signifikanta prediktorer för de sociala funktionerna (att påverka/kommunicera med andra, undvika krav eller identifiera sig med kamrater). Ångestsymptom var unikt associerade med sociala funktioner. Symptom på ångest och dissociation medierade vidare relationen mellan fysisk misshandel och sociala självskadefunktioner.

Sammanfattningsvis visade resultaten att självskadebeteende är vanligt förekommande hos ungdomar. Avhandlingen bidrar med empiri till diskussionen gällande icke-suicidal självskada i DSM-5. Det är viktigt att beakta olika negativa livserfarenheter och traumasymptom i relation till självskadebeteende hos ungdomar. Att undersöka självskadebeteendets funktioner kan vara kliniskt hjälpsamt för att utveckla och utvärdera individuellt anpassade behandlingsstrategier.

List of Publications

- I. Zetterqvist, M., Lundh, L.-G., Dahlström, Ö., & Svedin, C. G. (2013). Prevalence and function of non-suicidal self-injury (NSSI) in a community sample of adolescents, using suggested DSM-5 criteria for a potential NSSI disorder. *Journal of Abnormal Child Psychology*, 41, 759-773.
- II. Zetterqvist, M., Lundh, L.-G., & Svedin, C. G. (2013). A comparison of adolescents engaging in self-injurious behaviors with and without suicidal intent: Self-reported experiences of adverse life events and trauma symptoms. *Journal of Youth and Adolescents*, 42, 1257-1272.
- III. Dahlström, Ö., Zetterqvist, M., Lundh, L.-G., & Svedin, C. G. (2014). The functions of non-suicidal self-injury. Exploratory and confirmatory factor analyses in a large community sample of adolescents. Manuscript under review.
- IV. Zetterqvist, M., Lundh, L.-G., & Svedin, C. G. (2014). Non-suicidal self-injury in adolescents: Support for a specific distress – function relationship. *Child and Adolescent Psychiatry and Mental Health*, 8. doi:10.1186/1753-2000-8-23

Abbreviations

AIC	Akaike information criterion
ANCOVA	Analysis of covariance
ANR	Automatic negative reinforcement
APA	American Psychiatric Association
APR	Automatic positive reinforcement
BIC	Bayes information criterion
BPD	Borderline personality disorder
CFA	Confirmatory factor analysis
CFI	Comparative fit index
DSH	Deliberate self-harm
DSHI	Deliberate Self-Harm Inventory
DSM	Diagnostic and Statistical Manual of Mental Disorders
EAM	Experiential avoidance model
EFA	Exploratory factor analysis
EOS	Endogenous opioid system
ES	Effect size
FASM	Functional Assessment of Self-Mutilation
FFM	Four-function model
ISAS	Inventory of Statements About Self-Injury
LYLES	Linköping Youth Life Experience Scale
MPQ	Motives for Parasuicide Questionnaire
NSSI	Non-suicidal self-injury
NSSI-AT	Non-Suicidal Self-Injury Assessment Tool
OSI	Ottawa Self-Injury Inventory
PCA	Principal component analysis
PTSD	Posttraumatic stress disorder
QNSSI	Questionnaire for Non-Suicidal Self-Injury
RMSEA	Root mean square error of approximation
SA	Suicide attempt
SASII	Suicide Attempt Self-Injury Interview
SFS	Svensk författningssamling
SHBQ	Self-Harm Behavior Questionnaire
SHRQ-R	Self-Harm Reasons Questionnaire revised
SIB	Self-injurious behavior
SIMS	Self-Injury Motivation Scale
SIQ	Self-Injury Questionnaire
SITBI-SF-SR	Self-Injurious Thoughts and Behaviors Interview short-form self-report
SNR	Social negative reinforcement
SPR	Social positive reinforcement
SRMR	Standardized root mean square residual
TLI	Tucker-Lewis index
TSCC	Trauma Symptom Checklist for Children
WLSMV	Robust mean and variance adjusted weighted least squares
WRMR	Weighted root mean square residual

Introduction

Background

Towards the end of the twentieth century, health care professionals and staff working in schools began to express concern over the proportions that adolescent self-injury had assumed in Sweden. There was a general impression that the problem was growing and that we were confronted with a behavior that was difficult to understand and to treat. Self-injury was also receiving increased media coverage as well as being portrayed on the Internet. Phrases such as “an epidemic” and “the new teenage illness” began to appear. The behavior was puzzling to many people, even provoking to some. Humans have a natural drive to survive and to avoid pain, so why would anyone intentionally hurt themselves? How should the behavior be conceptualized? What is its relationship to suicide? In 2004 the National Board of Health and Welfare in Sweden published a report: “What do we know about girls who cut themselves?” (Socialstyrelsen, 2004). The report concluded that there was a pressing lack of knowledge about adolescent self-injury, and, above all, a lack of relevant treatment research and recommendations for this age group. This lack of knowledge and the somewhat provoking nature of self-injury have unfortunately meant that individuals with self-injury have sometimes been exposed to negative attitudes from health care staff (Taylor, Hawton, Fortune, & Kapur, 2009). During the last decade there has been a virtual explosion of research on self-injury. Like most new research fields it has had its definitional and conceptual challenges. Nonetheless, advances have been made towards the understanding of this complex, multi-determined behavior and the mechanisms involved. Some questions and controversies remain, however, such as whether non-suicidal self-injury should be included in the Diagnostic and Statistical Manual of Mental Disorders (DSM; American Psychiatric Association [APA], 2013) as a separate diagnostic entity. The related question of suicidal intent is also still a subject of debate. Furthermore, there is still a lack of empirically supported treatments for self-injury in adolescents, and the need for treatment research is urgent. In Sweden there has recently been political acknowledgement of the problem, and a national self-injury project is currently in progress with the aim of developing and coordinating activities to decrease the number of young people with self-injurious behavior.

This thesis aims at addressing some of the existing gaps in the literature by examining non-suicidal self-injury in Swedish adolescents in the county of Östergötland, by investigating the prevalence and methods of non-suicidal self-injury (study I), by analyzing the difference between suicidal and non-suicidal self-injury and its associations with adverse life events and trauma symptoms (study II), and by further examining the functions of self-injury (study I, III and IV) which have direct implications for treatment.

History

Although there is a general impression that self-injury escalated during the 1990s and in the following years, the phenomenon is not in any way new. Human beings have intentionally inflicted pain on themselves from the beginning of time and a historical glance will show us that there are several early descriptions of this phenomenon. In Sophocles’ play *Oedipus the King* (Sophocles, 2010 version), for example, Oedipus stabs out his own eyes as punishment when he realizes that he was blind to the fact that he had bedded his own mother. In the Bible there is a description of a man cutting himself with stones (Mark 5:5), and the Gospel according to St. Mark further states that “if thy hand offend thee, cut it off: it is better for thee to enter into life maimed, than having two hands to go into hell, into the fire that never shall be quenched...” (Mark 9:43, and almost identically recorded in the Gospel of St. Matthew 5:30). According to

Favazza (1996), this passage has had a large impact on self-injuring individuals throughout history.

Different cultural interpretations of self-injury have been put forward at different times in history. It has been interpreted as an expression of severe (psychotic) mental illness, for example, as religious mania, as a characteristic of primitive societies or as masochistic sexuality (Gilman, 2013). During the nineteenth century case reports of self-harmers began to appear in the medical literature (Favazza & Conterio, 1989). In Sweden there are records from the eighteenth and early nineteenth century of women with serious self-injurious behavior (Johannisson, 1997). In 1938 one of the first attempts to classify self-injury was made by Karl Menninger, who suggested that the behavior should be divided into neurotic, religious and psychotic self-mutilation, as well as self-mutilation in organic diseases and in customary and conventional forms (Menninger, 1938). During the 1960s scientific reports were being published in psychiatric journals referring mainly to wrist cutting or slashing which was predominately associated with the female gender (Graff & Mallin, 1967; Grunebaum & Klerman, 1967; Pao, 1969). Interestingly, already in the 1960s the challenges facing clinicians and the difficulties in successful treatments were depicted: "In the past several years wrist slashers have become the new chronic patients in mental hospitals...The difficulty in treating wrist slashers demands closer attention to the causes and possible means of therapy" (Graff & Mallin, 1967, p. 74).

During this time, inspired by psychoanalysis, self-injury began to be regarded as a symptom of borderline personality disorder (BPD) (Gilman, 2013) and when BPD appeared in the third edition of the DSM the following description was included: "Frequently there is impulsive and unpredictable behavior that is potentially physically self-damaging" (APA, 1980, p. 321). The acts were defined as "...suicidal gestures, self-mutilation, recurrent accidents or physical fights" (APA, 1980, p. 323). The phenomenon of self-injury has also been acknowledged by trauma theory and feminist theory (Gilman, 2013). During the 1980s proposals to view self-harm as a separate diagnostic entity were put forward with descriptions of characteristics and distinguishable features (Kahan & Pattison, 1984; Pattison & Kahan, 1983). A few years later Favazza's groundbreaking "Bodies under Siege: Self-Mutilation and Body Modification in Culture and Psychiatry" (Favazza, 1987 [first edition], 1996 [second edition]) was published, the first comprehensive account of self-mutilation.

Before the 1980s self-injury was rarely depicted in media (Purington & Whitlock, 2010). During the last two decades self-injury has appeared much more frequently in popular culture. Famous people have also given personal accounts of self-injury. Today it is widespread on the Internet (Lewis, Heath, Michal, & Duggan, 2012; Lewis, Heath, St Denis, & Noble, 2011; Purington & Whitlock, 2010) with adolescent phenomena such as "cut for Bieber", for example.

To summarize, from originally being mainly associated with severe (psychotic) mental illness and/or religion and then with the female gender and BPD, nowadays non-suicidal self-injury is also acknowledged as being a common behavior in adolescent and young adult non-clinical populations.

Definition and Classification

The research area of self-injury has a history of definitional challenges. The differences in definition and terminology are not just one of semantics, but also reflect ambiguity as to how the construct should be conceptualized (Andover, Morris, Wren, & Bruzzese, 2012). Should non-suicidal self-injury be seen as a symptom of a mental disorder, and more specifically as a criterion of BPD (APA, 1994)? As a separate diagnostic entity (Muehlenkamp, 2005)? As a general signal of distress? As a disorder of impulse control (Favazza & Rosenthal, 1990, 1993) or

as difficulties with emotion dysregulation (Gratz, 2007; Linehan, 1993)? Or is it perhaps an addiction (Nixon, Cloutier, & Aggarwal, 2002; Victor, Glenn, & Klonsky, 2012)? And what about its relationship to suicide (De Leo, 2011)? And more indirect forms of self-injury (Nock, 2010)? A plethora of terminologies have been used, of which non-fatal suicidal behavior, focal suicide, auto-aggression, parasuicide, deliberate self-harm, cutting, self-mutilation and non-suicidal self-injury are some examples.

Various attempts have been made to classify the behavior. Pattison and Kahan (1983) and Kahan and Pattison (1984), for example, classified it according to three different dimensions: direct–indirect, low vs. high lethality, and single vs. multiple episodes. They postulated that deliberate self-harm was characterized by patterns of recurrent episodes with low lethality despite multiple methods, beginning in late adolescence, often continuing for years and was associated with certain psychological states. Favazza has presented a comprehensive system to classify self-injury (Favazza, 1987, 1996; Favazza & Rosenthal, 1990, 1993), most recently in Simeon and Favazza (2001), dividing the behavior into four categories: (1) stereotypic, (2) major, (3) compulsive, and (4) impulsive. Hair pulling and skin picking are illustrative examples of compulsive forms, whereas skin cutting and burning would be classified as impulsive self-injury. The latter is further differentiated into episodic and repetitive types (Simeon & Favazza, 2001). Major self-injury is usually performed in connection with psychotic disorders (generally self-mutilation of whole parts of the body). Yet another distinction is made regarding stereotypic behaviors such as head banging among individuals with pervasive developmental disorders or certain syndromes, such as Lesch-Nyhan.

A distinction is made between self-injury without suicidal intent and actual suicide attempts (Nock & Favazza, 2009), but the issue of suicidal intent is a controversial and complex one. The term deliberate self-harm (DSH), which nowadays is mainly used in the UK and Europe, includes a broad spectrum of non-fatal self-harm, irrespective of the degree or type of motive or level of suicidal intent, thus including overdosing and suicide attempts in the definition (Hawton et al., 2003; Hawton, Saunders, & O'Connor, 2012; Madge et al., 2008; Skegg, 2005). The terms self-injury or non-suicidal self-injury that have gained ground in North America refer to behaviors performed without suicidal intent. Yet another distinction is made between direct and indirect self-injurious behavior (Nock, 2010; St Germain & Hooley, 2012). Indirect self-injurious behaviors might, for example, include involvement in abusive relationships, substance abuse and other risky or reckless behavior. There can be an overlap between these behaviors, but there is empirical support for separating and distinguishing between direct and indirect forms of self-injury (St Germain & Hooley, 2012).

In the present thesis the term non-suicidal self-injury (NSSI) will be used, in accordance with the definition formulated by The International Society for the Study of Self-Injury (2007): “the deliberate, self-inflicted destruction of body tissue without suicidal intent and for purposes not socially sanctioned... As such, NSSI is distinguished from suicidal behaviors involving an intent to die, drug overdoses, and socially sanctioned behaviors performed for display or aesthetic purposes...”

There has been a similar lack of standardized nomenclature for suicidal behaviors (O'Carroll, Berman, Maris, Moscicki, Tanney, & Silverman, 1996; Silverman, 2006; Silverman, Berman, Sanddal, O'Carroll, & Joiner, 2007a, 2007b). In this thesis a suicide attempt is defined as a “...potentially self-injurious behavior in which there is some intent to die” (Nock, 2010, p. 342), on at least a nonzero level (O'Carroll et al., 1996). Anything more than zero suicidal intent is thus interpreted as a suicide attempt, in order not to underestimate risk and likelihood of death (Nock, 2010). Although intent can be ambiguous, many argue that it is both possible and meaningful to

distinguish between self-injurious behaviors on the basis of intent to die (e.g., Muehlenkamp, 2005; Nock & Kessler, 2006; Wilkinson, 2011).

Non-Suicidal Self-Injury in DSM-5

In the diagnostic nomenclature NSSI has been limited to a symptom of BPD (APA, 1994) as suicidal behavior, gestures, threats or self-mutilating behavior. Arguments have been put forward that NSSI should be a separate syndrome, distinct from suicide and BPD (Favazza, 1996; Favazza & Rosenthal, 1990, 1993; Herpertz, 1995; Kahan & Pattison, 1984; Muehlenkamp, 2005; Pattison & Kahan, 1983; Tantam & Whittaker, 1992). In the early 1980s Pattison and Kahan (1983) and Kahan and Pattison (1984) described the typical patterns of a separate deliberate self-harm syndrome, proposing that it should be included in the DSM-IV (APA, 1994) with inability to resist the impulse to injure oneself, increased sense of tension prior to the act and experience of release/relief after the act as essential features. Later, Favazza and Rosenthal (1990, 1993) suggested DSM inclusion of the repetitive self-mutilation syndrome and complemented earlier descriptions by adding a preoccupation with harming oneself.

The earlier features overlap with the suggested Shaffer and Jacobson (2009) NSSI criteria proposed to the DSM-5 Childhood Disorder and Mood Disorders work group for inclusion as a DSM-5 disorder, in that they both describe the functional, motivational and emotional aspects of NSSI (Manca, Presaghi, & Cerutti, 2014). Shaffer and Jacobson (2009) highlighted several reasons in their rationale for reclassifying NSSI: the DSM-IV classification of NSSI as a symptom of BPD is inconsistent with recent evidence; NSSI needs to be separated from suicide attempts; studying NSSI purely within a BPD context or as a manifestation of suicidality will hamper research and treatment of NSSI, which a separate diagnosis would encourage; a standardized definition of clinically significant NSSI would facilitate comparisons of findings from different studies and improve communication and clarity in clinical care. NSSI was, however, finally placed in Section III of DSM-5: Emerging Measures and Models, as a condition that requires further study (APA, 2013). See Table 1 for DSM-5 NSSI criteria.

The criteria have been revised several times during the work progress, mainly concerning their organization (APA, 2012, 2013; Shaffer & Jacobson, 2009). The initial criteria, for example, included the not otherwise specified categories “subthreshold” and “intent uncertain” (Shaffer & Jacobson, 2009, p. 5), which were later omitted. That the behavior should not be a common one was originally included in the first criteria, as was the text that the behavior should not be socially sanctioned, which in the DSM-5 version was instead included as a criterion on its own. The contingent response aspect of the behavior, with expectations of consequences after performing NSSI, was previously included as one of four under the earlier B criterion, but in the final DSM-5 version is also a separate criterion.

Table 1

Nonsuicidal Self-Injury Criteria in DSM-5

-
- A. In the last year, the individual has, on 5 or more days, engaged in intentional self-inflicted damage to the surface of his or her body of a sort likely to induce bleeding, bruising, or pain (e.g., cutting, burning, stabbing, hitting, excessive rubbing), with the expectation that the injury will lead to only minor or moderate physical harm (i.e., there is no suicidal intent).
 Note: The absence of suicidal intent has either been stated by the individual or can be inferred by the individual's repeated engagement in a behavior that the individual knows, or has learned, is not likely to result in death.
- B. The individual engages in the self-injurious behavior with one or more of the following expectations:
1. To obtain relief from a negative feeling or cognitive state.
 2. To resolve an interpersonal difficulty.
 3. To induce a positive feeling state.
- Note: The desired relief or response is experienced during or shortly after the self-injury, and the individual may display patterns of behavior suggesting a dependence on repeatedly engaging in it.
- C. The intentional self-injury is associated with at least one of the following:
1. Interpersonal difficulties or negative feelings or thoughts, such as depression, anxiety, tension, anger, generalized distress, or self-criticism, occurring in the period immediately prior to the self-injurious act.
 2. Prior to engaging in the act, a period of preoccupation with the intended behavior that is difficult to control.
 3. Thinking about self-injury that occurs frequently, even when it is not acted upon.
- D. The behavior is not socially sanctioned (e.g., body piercing, tattooing, part of a religious or cultural ritual) and is not restricted to picking a scab or nail biting.
- E. The behavior or its consequences cause clinically significant distress or interference in interpersonal, academic, or other important areas of functioning. The behavior does not occur exclusively during psychotic episodes, delirium, substance intoxication, or substance withdrawal. In individuals with a neurodevelopmental disorder, the behavior is not part of a pattern of repetitive stereotypies. The behavior is not better explained by another mental disorder or medical condition (e.g., psychotic disorder, autism spectrum disorder, intellectual disability, Lesch-Nyhan syndrome, stereotypic movement disorder with self-injury, trichotillomania [hair-pulling disorder], excoriation [skin-picking disorder]).
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Different arguments have been put forward for a separate diagnostic entity. As Shaffer and Jacobson (2009) pointed out, one such argument concerns the relationship between NSSI and BPD. There is general consensus that there is an association between BPD and NSSI (Andover, Pepper, Ryabchenko, Orrico, & Gibb, 2005; Glenn & Klonsky, 2009; Jacobson, Muehlenkamp, Miller, & Turner, 2008; Klonsky, Oltmanns, & Turkheimer, 2003), but that NSSI is not unique to BPD (Glenn & Klonsky, 2013). It is also associated with other personality disorders (Klonsky et al., 2003; Nock, Joiner, Gordon, Lloyd-Richardson, & Prinstein, 2006) and to several axis I symptomatologies (Andover et al., 2005; Darche, 1990; Favazza & Conterio, 1989; Klonsky et al., 2003; Nock et al., 2006), and also may be present without any psychiatric comorbidities (Wilkinson, 2013). To classify NSSI purely as a criterion of BPD implies that it does not have clinical significance outside the BPD context (Glenn & Klonsky, 2013). Rates of NSSI in adolescents are far higher than rates of BPD (Jacobson et al., 2008; Nock et al., 2006), which may lead to BPD being over-diagnosed. It is also questionable whether it is appropriate to diagnose adolescents with BPD (Wilkinson, 2013). Although some argue that it is possible (Courtney-Seidler, Klein, & Miller, 2013), there is a general reluctance to diagnose adolescents with personality disorders. Thus NSSI has not readily been visible in the diagnostic documentation, although the behavior may constitute a serious problem, needing specific treatment. Despite the fact that the behavior is prevalent and impairing in adolescents, it has been given no psychopathological significance until DSM-5 (Wilkinson, 2013).

Another argument refers to the relationship between NSSI and suicide attempts. In DSM-IV (APA, 1994) the BPD criterion of suicidal behaviors and NSSI are not separated, which can lead to inaccurate case conceptualization, risk assessment, treatment and iatrogenic hospitalization (Glenn & Klonsky, 2013). There is also concern that a lack of distinction between suicidal and non-suicidal self-injury may lead to higher prevalence rates of suicide in epidemiological research. Those in favor of a separate NSSI diagnosis claim that the advantages are manifold: improved communication, more precise definition and clearer prognostic and treatment implications (e.g., Glenn & Klonsky, 2013; Ward et al., 2013; Wilkinson, 2013; Wilkinson & Goodyer, 2011). In particular, the consequences for treatment research would be beneficial, allowing NSSI to be highlighted and treated outside the BPD context (Butler & Malone, 2013; Plener & Fegert, 2012; Wilkinson, 2013).

Concern has also been voiced, however, that the NSSI diagnostic criteria have been prematurely concretized (De Leo, 2011). Most of the controversies concern the issue of suicidal intent, where critics argue that suicide intent should not be reduced to a dichotomy, but should rather be conceptualized as a dimensional construct with ambivalence and multiple motivations involved simultaneously, making it difficult to measure. Critics also claim that NSSI is a behavior, not a disorder. There is also concern that a diagnosis could increase stigmatization in a young age group (De Leo, 2011; Kapur, Cooper, O'Connor, & Hawton, 2013). An additional concern is the issue of self-poisoning performed without suicidal intent, which is not included in the current NSSI definition, leaving "non-suicidal self-poisoning in the classificatory wilderness" (Kapur et al., 2013, p. 326). The proposed NSSI diagnosis has also been discussed from a philosophical (Kapusta, 2012) and historical perspective (Gilman, 2013). Furthermore, critics claim that the lack of empirical support for an NSSI diagnosis argues for caution at this stage (De Leo, 2011; Kapur et al., 2013). Only recently has empirical data begun to emerge where NSSI criteria have been applied. It is important that empirical research continues (Plener, Kapusta, Kölch, Kaess, & Brunner, 2012), particularly in adolescent samples, since NSSI is especially prevalent during adolescence (Glenn & Klonsky, 2013).

One study on adults distinguished potential NSSI disorder from BPD, providing important information on the possible existence of NSSI as a potentially separate diagnostic entity (Selby, Bender, Gordon, Nock, & Joiner, 2012). Treatment-seeking patients ($n = 571$) were classified into different groups: NSSI ($n = 65$), BPD ($n = 24$) and clinical comparisons ($n = 482$). The NSSI group had more suicide attempts and more depressive symptoms and anxiety than the clinical control group. There were no differences in comorbidity and functional impairment between the NSSI and BPD groups. The BPD group contained more women and reported higher rates of abuse than the NSSI group. Results support a diagnostic entity where NSSI without BPD is related to impaired functioning and distress. The same sample was also used in a later study by Ward et al. (2013) that aimed at providing a preliminary evaluation of the treatment response of a potential NSSI disorder. The NSSI group had a worse prognostic outcome after therapy than an axis I comparison group, but similar to the BPD group. Despite this, the NSSI group showed improvement after treatment and the authors suggest a preliminary positive prognosis with treatment.

Barrocas, Hankin, Young, and Abela (2012) found that 1.5% of 665 community youths reported ≥ 5 NSSI episodes, had engaged in NSSI with expectations and confirmed the distress criterion. However, not all NSSI disorder criteria were assessed in this study. Notably, their sample included younger children, aged 7-16 years.

In-Albon, Ruf, and Schmid (2013) used a sample of 73 female inpatient adolescents and 37 nonclinical adolescents (13-19 years) in their study. Eighty percent of the adolescents who met NSSI criteria did not meet criteria for BPD, lending support to a separate diagnostic entity. They

found that NSSI was comorbid with a wide range of disorders, such as major depression, posttraumatic stress disorder (PTSD) and social phobia. Sixty-nine percent of those with an NSSI diagnosis reported having made a suicide attempt, but at the same time reported that their NSSI was non-suicidal. Authors concluded that NSSI has to be distinguished from suicidal behavior.

Glenn and Klonsky (2013) assessed NSSI disorder in 198 adolescent psychiatric inpatients (12-18 years) using proposed DSM-5 criteria. Fifty percent of the total sample and 78% of the self-injuring sample met NSSI disorder criteria. They compared those who met criteria to a non-NSSI disorder group of clinical adolescents. More girls than boys met criteria and the NSSI disorder group had more axis I disorders than the non-NSSI comparison group. There was significant overlap between NSSI disorder and BPD, but the diagnostic overlap between BPD and other disorders was similar to that between BPD and NSSI disorder. The NSSI group reported more suicide ideation and attempts as well as greater emotion dysregulation and loneliness than the clinical comparison group. The associations between NSSI disorder and clinical impairment remained significant when controlling for BPD.

Lengel and Mullins-Sweatt (2013) asked 119 clinicians and experts to rate whether the NSSI criteria represented prototypic cases/symptoms of a self-injuring patient. Concerning the first criterion A, the majority of participants agreed that the DSM-5 description of what constitutes NSSI fitted the prototypic self-injurer. There was also general agreement regarding the other criteria, but with some variability. Negative emotions or thoughts prior to NSSI was considered a prototypic symptom, as was anticipation of a consequence, while the frequent urge to engage in NSSI and clinically significant distress or interference resulting from NSSI had below 50% endorsement as prototypic symptoms.

Odelius and Ramklint (2014a) conducted a pilot study where they assessed suggested DSM-5 criteria by interviewing 39 young self-harming psychiatric outpatients in Sweden, aged 13-25 years. Of these, 46% fulfilled criteria for the NSSI diagnosis. Patients had several diagnoses which were not concomitant with BPD. Of those who did not receive an NSSI diagnosis, 43% failed because they did not fulfill the distress or interference criterion. The interviewers considered this criterion difficult to assess, since patients tended to report that their self-harm was helpful. There was no difference between the NSSI and the non-NSSI group with regard to comorbid diagnoses (including BPD). There was a trend towards a higher frequency of suicide ideation in the NSSI group and they were also assessed as having a higher suicide risk. The authors state that caution must be taken, however, due to the small sample in the study.

To summarize the results from the empirical studies, the authors conclude that their findings support that NSSI constitutes a distinct and clinically significant diagnostic entity (Glenn & Klonsky, 2013; Lengel & Mullins-Sweatt, 2013): “In summary, our study suggests that the proposed DSM-5 criteria for NSSI are useful and necessary to promote research on aetiology, course, and the development of effective treatment strategies and interventions for adolescents suffering from NSSI” (In-Albon et al., 2013, p. 10).

Non-Suicidal and Suicidal Self-Injury

The term non-suicidal self-injury and the suggested DSM-5 NSSI criteria states per definition that the behavior is non-suicidal and as such needs to be separated from suicide attempts (SA). The relationship between NSSI and suicide attempts is complex and nuanced (Klonsky, May, & Glenn, 2013) and there is general agreement that there is an overlap between non-suicidal and suicidal self-injury (Klonsky & Muehlenkamp, 2007; Nock et al., 2006). Both obviously involve intentional damage to the body and share some similarities with regard to etiological pathways (Wichstrøm, 2009; Wilkinson, 2011). Recent longitudinal research has found that NSSI predicts

suicide attempts in clinical samples of depressed adolescents (Asarnow et al., 2011; Wilkinson, Kelvin, Roberts, Dubicka, & Goodyer, 2011), as well as in community samples of adolescents (Guan, Fox, & Prinstein, 2012) and Whitlock et al. (2013) suggested that NSSI may be a gateway to suicide. Suicidal behavior and NSSI tend to co-occur (Andover et al., 2012; Asarnow et al., 2011; Hamza, Stewart, & Willoughby, 2012; Plener, Libal, Keller, Fegert, & Muehlenkamp, 2009; Whitlock et al., 2013) and between 14-70% of clinical groups report both behaviors (Andover et al., 2012). Tuisku et al. (2014), for example, found that 53% of those with NSSI in their clinical sample of adolescents also reported a suicide attempt. Nock et al. (2006) found that as many as up to 70% of those who reported NSSI also reported a lifetime prevalence of suicide attempts. However, the vast majority of adolescents in community samples who engage in NSSI do not report suicide intent (Brausch & Gutierrez, 2010; Hilt, Cha, & Nolen-Hoeksema, 2008; Laye-Gindhu & Schonert-Reichl, 2005; Lloyd-Richardson, Perrine, Dierker, & Kelley, 2007; Muehlenkamp, 2005; Muehlenkamp & Gutierrez, 2007; Plener, Libal, Keller, et al., 2009). At any given time individuals are normally clear whether there is an intent to die or not when performing self-injurious behavior (SIB) (Wilkinson, 2011), which is supported by studies of youth that clearly differentiate between suicidal and non-suicidal behavior (Hilt, Cha, et al., 2008; Laye-Gindhu & Schonert-Reichl, 2005; Lloyd-Richardson et al., 2007).

Arguments have thus been put forward that non-suicidal and suicidal self-injury need to be differentiated (e.g., Muehlenkamp, 2005; Walsh, 2006; Yates, 2004). In addition to the difference in intent, i.e., permanent escape vs. modification of consciousness (Muehlenkamp, 2005; Walsh, 2006), research has consistently demonstrated differences between NSSI and attempted suicide concerning aspects such as lethality, methods, prevalence, frequency and functions (Csorba, Dinya, Plener, Nagy, & Páli, 2009; Kahan & Pattison, 1984; Muehlenkamp, 2005; Walsh, 2006), and the behaviors are regarded as being “phenomenologically distinct” (Andover et al., 2012, p. 3). There seems to be a difference in age of onset, with NSSI being an “earlier manifestation of vulnerability” (Tuisku et al., 2014, p. 317) and NSSI predicting suicide attempts, and not the other way round (Asarnow et al., 2011; Wilkinson et al., 2011). With regard to the level of physical damage and potential lethality, the chosen method of self-harm often communicates information about the intent (Walsh, 2006). In Sweden only 2.0% of all completed suicides were through acts of cutting during 2012 (Jiang, Hadlaczky, & Wasserman, 2014). There is also a difference in the type of medical attention needed (Muehlenkamp, 2005), and the frequency rate of NSSI is generally far higher than that of suicide attempts (Muehlenkamp, 2005; Walsh, 2006). There are also differences in functions (Baetens, Claes, Muehlenkamp, Grietens, & Onghena, 2011; Brown, Comtois, & Linehan, 2002). After a suicide attempt people who are suicidal often have enduring psychological pain, while the emotional state after an act of NSSI is rather the opposite (Walsh, 2006). These findings are supported by Chapman and Dixon-Gordon (2007), who showed that individuals who had attempted suicide reported more negative and less positive emotions after the act, compared to those who had engaged in NSSI. Demographic differences between the two have also been found (older men vs. younger adolescents) (Muehlenkamp, 2005).

Ignoring intent in describing self-injury can therefore lead to an overestimation of the prevalence of suicide attempts and prevent correct identification of specific risk factors for the respective behaviors (Nock & Kessler, 2006). This is shown in a study by Kumar, Pepe, and Steer (2004) where a majority (88%) of the psychiatric inpatient adolescents reported having experienced that their NSSI (cutting) was misinterpreted as a suicide attempt. Wilkinson (2011) stated that epidemiological studies need to separate suicidal from non-suicidal self-injury when examining common and distinct antecedents, correlates and outcomes of these behaviors, a standpoint supported by Andover et al. (2012) in a recent review article.

Recent research that has differentiated suicidal from non-suicidal self-injury in adolescents has found that the NSSI+SA group had higher levels of pathology compared to the NSSI group (Andover et al., 2012; Cloutier, Martin, Kennedy, Nixon, & Muehlenkamp, 2010). More depressive symptoms (Dougherty et al., 2009; Jacobson et al., 2008; Muehlenkamp & Gutierrez, 2007; Taliaferro, Muehlenkamp, Borowsky, McMorris, & Kugler, 2012), hopelessness (Dougherty et al., 2009; Taliaferro et al., 2012), suicidal ideation (Brausch & Gutierrez, 2010; Dougherty et al., 2009; Muehlenkamp & Gutierrez, 2007) and history of physical abuse (Asarnow et al., 2011; Taliaferro et al., 2012) were found in the NSSI+SA group compared to the NSSI group in both community and clinical samples. In addition, fewer reasons for living (Muehlenkamp & Gutierrez, 2007) and less parental support (Brausch & Gutierrez, 2010) have also been reported by individuals with NSSI+SA in community samples. In clinical groups of adolescents the NSSI+SA group was found to have more extensive histories of NSSI (Boxer, 2010; Jacobson et al., 2008), PTSD (Jacobson et al., 2008) and family conflict (Asarnow et al., 2011) and were more likely to show symptoms of BPD (Muehlenkamp, Ertelt, Miller, & Claes, 2011). In the light of these results, the SA and NSSI groups tend to fall between the no-SIB and NSSI+SA group (Asarnow et al., 2011), with multiple forms of self-injury (NSSI+SA) representing a more severe group with more psychological distress compared to adolescents who engage in NSSI alone (Hamza et al., 2012) in both community and clinical samples.

Several researchers (e.g., Andover & Gibb, 2010; Klonsky et al., 2013; Turner, Layden, Butler, & Chapman, 2013; Whitlock & Knox, 2007; Wilkinson et al., 2011) attribute their findings concerning the relationship between NSSI and suicide to Joiner's interpersonal theory, which postulates that suicide requires both the desire and the capability for suicide (Joiner, 2005; Van Orden et al., 2010). It is thought that individuals habituate to suicide through repeated painful experiences (such as sexual and physical abuse). Past self-injury may also habituate the individual to pain and provocation, a desensitization process that potentially leads to the ability to engage in lethal self-injurious behavior (Joiner, 2005). Those with many NSSI methods, classified as a high severity group, were significantly more likely to report features of suicidality than those with less severity (Whitlock, Muehlenkamp, & Eckenrode, 2008). NSSI frequency has been found to be associated with suicide attempts (Andover & Gibb, 2010; Whitlock & Knox, 2007; Whitlock et al., 2013), while Nock et al. (2006) and Turner et al. (2013) instead found that multiple and versatile methods were more often associated with suicide risk. These results can be interpreted as possible support for Joiner's theory. When an individual experiences more distress than she/he can cope with and NSSI no longer provides relief, then suicide can potentially develop from NSSI (Asarnow et al., 2011; Whitlock & Knox, 2007). Those with NSSI who had an increased risk for suicidality reported feeling less connected socially and experienced a reduced sense of meaning (Whitlock et al., 2013). The fact that NSSI predicts suicidality, even when demographics, mental health, trauma (Whitlock et al., 2013), depression, BPD, anxiety and impulsivity (Klonsky et al., 2013) are included in regression models, also lends support to Joiner's theory.

Prevalence

NSSI

Reported prevalence rates of self-injury in adolescents have varied tremendously. There are several ways in which this wide range in estimates can be interpreted. The fact that the methods of assessment have not been consistent across studies is in all likelihood the principal explanation. Both a recent review (Muehlenkamp, Claes, Havertape, & Plener, 2012), and a meta-analysis (Swannell, Martin, Page, Hasking, & St John, 2014) found that the measurement tool strongly influenced prevalence estimates of NSSI, with checklists resulting in higher rates than single item questions. According to Swannell et al. (2014), methodological factors contributed

over half (51.6%) of the heterogeneity in estimates of NSSI prevalence. Some checklists of NSSI items cover a wide range of NSSI methods, which increases prevalence rates, as does including milder types of NSSI, such as picking at a wound or biting lip (Nock, 2010). Further differences were found for anonymity vs. identifiable participants and self-administration vs. interview, with self-administered checklists with guaranteed anonymity producing the highest prevalence estimates (Muehlenkamp et al., 2012; Swannell et al., 2014). Prevalence rates of self-injury have also been based on different conceptualizations of what is being measured, such as excluding or including self-injury with suicidal intent. Somewhat surprisingly, in the review by Muehlenkamp and colleagues (2012) the rates of NSSI and DSH in adolescent samples did not differ significantly, with rates of 18.0% ($SD = 7.3$) and 16.1% ($SD = 11.6$), respectively. The result was very similar to the pooled NSSI prevalence of 17.2% among adolescents found by Swannell et al. (2014). Originally most studies were carried out in Anglo-Saxon countries, but nowadays there are epidemiological studies of adolescent NSSI available from several different countries around the world. After adjusting for methodology there was no difference in prevalence between different geographic regions in the meta-analysis by Swannell et al. (2014). This confirms results from Plener, Libal, Keller, et al. (2009), who did not find differences in prevalence rates of NSSI between USA and Germany. However, a later study by Plener et al. (2013) did find differences in prevalence between three European countries.

There are some uncertainties concerning the answer to the frequently asked question whether NSSI has actually increased over time, as has tentatively been suggested. In Sweden there has been an increase in inpatient care of deliberate SIB during the 2000s, declining somewhat during 2009 and 2010 (Socialstyrelsen, 2013). However, an increase in inpatient statistics cannot automatically be interpreted as representing an actual increase in NSSI. In the review by Muehlenkamp et al. (2012), mean prevalence rates had not increased during the past five years, which can be interpreted as a recent stabilization. Swannell et al. (2014) found that prevalence rates had increased over time before methodological factors were adjusted for. When methodological factors were taken into account there was no support for an increase and the authors therefore suggested that: “research methodology has developed over time to generate increasingly higher estimates” (p. 22).

In recent Swedish school-based studies, 34–42% of adolescents reported having engaged in NSSI at least once, when assessed with checklists (Jutengren, Kerr, & Stattin, 2011; Lundh, Wångby-Lundh, & Bjärehed, 2011), whilst repeated NSSI (defined as at least five instances) was reported by approximately 15–20% of adolescents. A single item question rendered a prevalence rate of 17% in a study measuring DSH, without differentiating on the basis of intent (Landstedt & Gillander Gådin, 2011). Internationally, prevalence rates of NSSI in community samples of adolescents usually range somewhere between 13–25% around the world (Baetens et al., 2011; Brunner et al., 2007; Brunner et al., 2014; Guan et al., 2012; Hankin & Abela, 2011; Jacobson & Gould, 2007; Laye-Gindhu & Schonert-Reichl, 2005; Martin, Swannell, Hazell, Harrison, & Taylor, 2010; Muehlenkamp & Gutierrez, 2004; Muehlenkamp, Williams, Gutierrez, & Claes, 2009; Nixon, Cloutier, & Jansson, 2008; Plener, Libal, Keller, et al., 2009; Plener et al., 2013; Ross & Heath, 2002; Tolmunen et al., 2008; You, Leung, Fu, & Lai, 2011; Zoroglu et al., 2003). However, both higher (Cerutti, Manca, Presaghi, & Gratz, 2011; Lloyd-Richardson et al., 2007; Lundh, Karim, & Quilisch, 2007; Yates, Carlson, & Egeland, 2008) and lower (Hilt, Nock, Lloyd-Richardson, & Prinstein, 2008; Patton et al., 2007; Prinstein et al., 2010) estimates have also been found, the latter sometimes due to younger samples.

Prevalence of NSSI in adolescent clinical samples is high, with estimates somewhere between 40–61% (Darche, 1990; DiClemente, Ponton, & Hartley, 1991; Klonsky & Muehlenkamp, 2007; Kumar et al., 2004). Nock and Prinstein (2004) found an 82% prevalence in their inpatient sample of 89 adolescents. In a recent prevalence study of adolescents in contact with child and

adolescent psychiatric clinics in Sweden, 73.8% of girls and 44.4% of boys under the age of 18 reported having engaged in NSSI at least once (Odelius & Ramklint, 2014b).

Prevalence of NSSI in young adults, which has most often been assessed with checklists in college samples in the US, ranges between 17-35% (Gratz, 2001; Gratz, Conrad, & Roemer, 2002; Klonsky & Glenn, 2009; Klonsky & Olino, 2008; Muehlenkamp, Brausch, Quigley, & Whitlock, 2013; Whitlock, Eckenrode, & Silverman, 2006; Whitlock et al., 2013). Thus, prevalence of NSSI in both adolescents and young adults is considerably higher than in adults, where studies have shown prevalence rates ranging from 4-6% (Briere & Gil, 1998; Klonsky, 2011; Klonsky et al., 2003) and approximately 19-25% in clinical groups (Briere & Gil, 1998). It is also noteworthy that many of those who report having self-injured have engaged in the behavior only once or a few times, representing a group with less severe NSSI and fewer clinical symptoms (Klonsky & Olino, 2008).

Several studies have shown NSSI to be more common in girls than boys (e.g., Howe-Martin, Murrell, & Guarnaccia, 2012; Laye-Gindhu & Schonert-Reichl, 2005; Muehlenkamp et al., 2009; Nixon et al., 2008; Plener, Libal, Keller, et al., 2009; Ross & Heath, 2002; Wong, Stewart, Ho, & Lam, 2007; You et al., 2011; Zoroglu et al., 2003), with examples of rates of 20.3% vs. 8.5% (Laye-Gindhu & Schonert-Reichl, 2005), 24.3% vs. 8.4% (Nixon et al., 2008) and 45.2% vs. 38.1% (Lundh, Wångby-Lundh, & Bjärehed, 2011). However, NSSI appears to be more prevalent in boys than has previously been estimated (Rodham & Hawton, 2009), and some studies have not found any gender differences in adolescents and young adults (Gratz et al., 2002; Hilt, Nock, et al., 2008; Klonsky & Muehlenkamp, 2007; Muehlenkamp & Gutierrez, 2007; Swannell et al., 2014; Whitlock et al., 2006). There is thus some uncertainty concerning gender and NSSI. Bresin and Gordon (2013b) suggested that NSSI is more common among girls in adolescent samples, but not in young adult college samples. On closer examination there would appear to be some support for gender difference when analyzing the choice of methods used, where girls are typically overrepresented when it comes to cutting (Garrison et al., 1993; Klonsky, 2011; Lundh et al., 2007; You et al., 2011) whereas boys more often report hitting/punching self, for example (You et al., 2011). Previously, NSSI was mostly estimated in psychiatric inpatient borderline samples, and BPD is more often diagnosed in females. Several studies on NSSI have had samples with more girls than boys and some of the earlier studies also asked specifically about cutting behaviors, which would lead to an apparent female overrepresentation.

Suicide

The suicide rates for boys/young men have been stable in Sweden during the time period 1980-2012 for the youngest age group (10-14 years) and shown a downward trend for ages 15-19 years. However, during the last decade suicides have tended to increase for 10-14 and 15-19 year olds. For girls/young women there has been a rising trend in suicide rates during 1980-2012 for both the 10-14 years and 15-19 years age group, as is the case during the last decade (Jiang et al., 2014). Internationally the prevalence rate of adolescents that report both NSSI and SA range between 14-31% in clinical samples (Asarnow et al., 2011; Boxer, 2010; Jacobson et al., 2008; Muehlenkamp et al., 2011) and between 3-7% in community samples (Brausch & Gutierrez, 2010; Muehlenkamp & Gutierrez, 2007; Plener, Libal, Keller, et al., 2009; Taliaferro et al., 2012).

Methods of NSSI

Several different methods of NSSI have been recognized: cutting/carving, self-hitting, burning, scraping skin, scratching, biting, rubbing and interfering with wound healing, for example. Many endorse several methods, both in adolescent and adult samples (Favazza & Conterio, 1989; Gratz, 2001; Klonsky, 2011; Klonsky & Glenn, 2009; Klonsky & Muehlenkamp, 2007; Nock, 2009;

Rodav, Levy, & Hamdan, 2014; Turner et al., 2013; Victor et al., 2012; Whitlock et al., 2006). Skin-cutting is one of the most common methods reported (Andrews et al., 2013; Csorba et al., 2009; Favazza, 1996; Klonsky, 2007; Klonsky & Muehlenkamp, 2007; Laye-Gindhu & Schonert-Reichl, 2005; Moran et al., 2012; Muehlenkamp, Kerr, Bradley, & Larsen, 2010; Nixon et al., 2008; Nock & Prinstein, 2004; Nock et al., 2006; Plener, Libal, Keller, et al., 2009; Victor et al., 2012; Whitlock et al., 2008). Other common methods are self-battery/punching self, burning skin, scratching and biting (Andrews et al., 2013; Csorba et al., 2009; Laye-Gindhu & Schonert-Reichl, 2005; Muehlenkamp, Kerr, et al., 2010; Nixon et al., 2008; Nock & Prinstein, 2004; Rodav et al., 2014; Ross & Heath, 2002; Whitlock et al., 2006). In a large study of a community/college population, the areas of the body most likely to be injured were the arms, followed by the hands, wrists, thighs and stomach (Whitlock et al., 2006).

Age of Debut and Prognosis

The debut age for NSSI is consistently found to be around 12-14 years (e.g., Heath, Schaub, Holly, Nixon, 2009; Jacobson & Gould, 2007; Kumar et al., 2004; Muehlenkamp & Gutierrez, 2007; Nixon et al., 2002; Nock, 2009; Rodham & Hawton, 2009). Rates of new cases of NSSI are considerably lower in young adulthood (Whitlock et al., 2013). A large population-based longitudinal study showed a substantial reduction in the frequency of self-harm during late adolescence and young adulthood (Moran et al., 2012). The authors suggested that most of the adolescent self-harming behavior resolves itself spontaneously. However, they also pointed out that adolescents who self-harmed often had associated mental health problems and that these symptoms might not be reduced without treatment. In a longitudinal study, Andrews, Martin, Hasking, and Page (2013) examined which risk factors and characteristics were associated with continuation vs. cessation of NSSI in community adolescents. Fifty percent of adolescents who reported NSSI at baseline continued to engage in the behavior over the one-year follow-up period. Other studies have found continuation in four out of eight adolescents in a 2½-year follow-up (Hankin & Abela, 2011), while a lower continuation rate of 10% was found in a 5-year follow-up (Wichstrøm, 2009), suggesting that adolescent NSSI is a comparatively transient phenomenon. Andrews and colleagues (2013) found that those who continued self-injuring reported increased methods, frequency, and potential lethality of NSSI.

NSSI and Adolescence

In the literature there is general agreement that there is a curvilinear relationship between NSSI and age, with rates of NSSI increasing during adolescence and declining towards adulthood (Moran et al., 2012). The fact that adolescence is such a high-risk period for engaging in NSSI is in all likelihood an interaction between (neuro)biological and psychosocial factors during this time period (Patton et al., 2007). One neurobiological model of adolescent brain development (Casey et al., 2010) proposes that there is an imbalance between brain systems that are critical to affective processing (e.g., subcortical limbic regions including the amygdala) in relation to the areas that are crucial for controlling emotional responses (e.g., the prefrontal cortex). It is possible that this discrepancy in the developing brain (Casey et al., 2010; Romeo, 2010; Steinberg, 2005, 2010; Yurgelun-Todd, 2007) has implications for the risk of engaging in NSSI to regulate emotion during adolescence. Results from Patton et al. (2007), who found that age was a protective factor against self-harm, can be interpreted as supporting this proposal. During adolescence there is great activity in regions associated with response inhibition, the calibration of risk and reward, and emotion regulation. A fuller self-awareness and the ability to regulate thoughts, feelings and behaviors are fundamental parts of adolescent development (Steinberg, 2005): "...it appears that changes in arousal and motivation brought on by pubertal maturation precede the development of regulatory competence in a manner that creates a disjunction between

the adolescent's affective experience and his or her ability to regulate arousal and motivation" (Steinberg, 2005, p. 69).

Adolescence is also a period often accompanied by an increased experience of life stress, such as interpersonal stressors, which can trigger NSSI (Jacobson & Mufson, 2012). Changes in psychological styles in response to stress, such as increased rumination and self-blaming, are suggested to play a part in the development of adolescent depression (Piccinelli & Wilkinson, 2000), styles that speculatively might have implications for NSSI as well. Adolescents exhibit heightened emotional reactivity and lability compared to both children and adults. A period of flux, with more negative and fewer extreme positive states, is evident during early adolescence, while emotions become more stable in late adolescence (Larson, Moneta, Richards, & Wilson, 2002).

A further challenge is the aspect of social contagion that has been reported for NSSI (Jarvi, Jackson, Swenson, & Crawford, 2013), for example peer socialization effects (Deliberto & Nock, 2008; Nock & Prinstein, 2005; Prinstein et al., 2010), to which adolescents probably are especially susceptible. The Internet is a natural part of life for most adolescents and offers plenty of information about NSSI (Lewis et al., 2011; Lewis et al., 2012; Purington & Whitlock, 2010). NSSI is also easily accessed and readily available in everyday life. This pragmatic aspect might also make it an attractive option for adolescents, compared to other functionally equivalent self-harming behaviors (Nock, 2009, 2010). Adolescence is also an intense time of identity development and some adolescents may come to form an identity as a self-injurer (Breen, Lewis, & Sutherland, 2013; Nock, 2009, 2010). There is some support that NSSI is associated with certain youth cultures and adolescents who identify with so-called alternative subcultures such as Goth and Emo have been found to be more likely to self-injure than others (Young, Sproeber, Groschwitz, Preiss, & Plener, 2014; Young, Sweeting, & West, 2006). Taken together, these different aspects of adolescent development may shed some light on the high prevalence found during this age period.

Risk Factors and Correlates of NSSI

Since NSSI is a relatively new research field, there has until fairly recently been a dearth of longitudinal studies. In consequence there is as yet no accumulation of evidence for risk factors in the literal meaning of the term and it is therefore more correct to speak of correlates of different psychosocial variables and NSSI (Fliege, Lee, Grimm, & Klapp, 2009). Childhood abuse and psychiatric disorders appear most consistently in the literature as correlates of NSSI (Nock, 2009). Childhood maltreatment is a powerful factor in the etiology of NSSI, but "...is neither necessary nor sufficient for self-injurious outcomes" (Yates, 2009, p. 129).

Maltreatment

The relationship between child maltreatment (such as sexual, physical and emotional abuse) and NSSI has been examined empirically (e.g., Gratz, Conrad, & Roemer, 2002; van der Kolk, Perry, & Herman, 1991), but with some inconsistent results. While some researchers have found support for a relationship between physical abuse and NSSI (e.g., Martin, Bureau, Cloutier, & Lafontaine, 2011; Paivio & McCulloch, 2004; Swannell et al., 2012; van der Kolk et al., 1991; Wachter, Murphy, Kennerley, & Wachter, 2009; Zoroglu et al., 2003), others have not (Gratz et al., 2002; Rallis, Deming, Glenn, & Nock, 2012). Similarly, results have also differed concerning sexual abuse and NSSI, where an association has been found in some studies (Glassman, Weierich, Hooley, & Deliberto, 2007; Martin et al., 2011; Yates et al., 2008; Zlotnick et al., 1996), while Klonsky and Moyer (2008) in their meta-analysis showed that the relationship between sexual abuse and NSSI is in fact relatively small. Despite these inconsistencies there is general agreement that childhood maltreatment is one of several factors to be considered along the

pathway leading to NSSI. The specific association between maltreatment experience and NSSI has turned out to be complex, suggesting that the relationship between maltreatment and negative health outcomes is also associated with common risk factors, such as high risk family environments, or different mediators (Klonsky & Moyer, 2008). Another more recent review (Maniglio, 2011) also reached the same conclusion and pointed out that although sexual abuse is a significant risk factor for both suicidal and non-suicidal self-injury, it should be considered general and non-specific, and other potentially confounding biological, psychological and social risk factors should ideally be controlled for when analyzing the relationship.

Family environment

It is thus not necessarily the abuse on its own, but also the quality of the family context in which it occurs, that contributes to NSSI (Gratz et al., 2002). There is empirical support for the effect of invalidating family environments on NSSI, such as neglect, criticism, fear and alienation in the parent-child relationship, as well as perceived lack of family support (e.g., Adrian, Zeman, Erdley, Lisa, & Sim, 2011; Bureau et al., 2010; Martin et al., 2011; Tatnell, Kelada, Hasking, & Martin, 2014) and insecure attachment (Gratz et al., 2002). High parental expressed emotion, in particular parental criticism, has been found to be associated with NSSI in adolescents (Wedig & Nock, 2007; Yates et al., 2008). Further support for this has been found in longitudinal studies where perceived family invalidation (You & Leung, 2012) predicted NSSI in adolescents.

Psychiatric disorders and symptomatology

Although NSSI may exist in adolescents who do not meet criteria for any diagnosis (Wilkinson, 2013), there is a correlation between psychiatric symptoms and NSSI, especially in clinical samples (Jacobson & Gould, 2007; Nock et al., 2006). There is a clear association between depressive symptoms and NSSI in adolescents and young adults, both in community samples (Garrison et al., 1993; Kerr & Muehlenkamp, 2010; Klonsky & Olino, 2008; Rodav et al., 2014) and clinical samples (Jacobson et al., 2008; Kumar et al., 2004; Nock et al., 2006). Depressive symptoms have predicted NSSI in several longitudinal studies of both clinical and community adolescent samples (Hankin & Abela, 2011; Lundh, Wångby-Lundh, Paaske, Ingesson, & Bjärehed, 2011; Marshall, Tilton-Weaver, & Stattin, 2013; You & Leung, 2012). Symptoms of anxiety and NSSI also tend to co-occur (Kerr & Muehlenkamp, 2010; Klonsky & Olino, 2008; Klonsky et al., 2003; Nock et al., 2006). In a sample of Turkish high school students, Zoroglu et al. (2003) found that trauma and dissociation contributed to self-mutilation, with dissociation being especially evident. In a population sample of 4,019 adolescents, Tolmunen et al. (2008) showed that high levels of dissociation were independently associated with current self-cutting. Further support for the relationship between dissociation and NSSI has been found by You et al. (2011), as well as for PTSD and NSSI (Nock et al., 2006).

The association between NSSI and features of BPD, mainly in clinical samples, is undeniable, since NSSI is a criterion of BPD (Crowell et al., 2012; Jacobson et al., 2008; Nock et al., 2006; Sadeh et al., 2014). There is also an association with other personality pathologies (Klonsky et al., 2003; Nock et al., 2006). A study of clinical female adolescents with a history of NSSI showed that 51.7% met criteria for a diagnosis of BPD (Nock et al., 2006). BPD features have also been found to predict future NSSI in young adults (Glenn & Klonsky, 2011). With regard to further symptomatology, a recent large-scale study of college students found a correlation between eating disorder symptoms and self-injury (Whitlock et al., 2006). There is some evidence for a relationship between substance abuse and self-injurious behaviors (Klonsky & Muehlenkamp, 2007; Moran et al., 2012; Nock et al., 2006). NSSI is often performed only a few minutes after the urge to engage in NSSI has arisen (Favazza & Conterio, 1989; Klonsky & Olino, 2008; Nock & Prinstein, 2005), and self-reported impulsivity has shown to be associated with NSSI (Herpertz, Sass, & Favazza, 1997; Janis & Nock, 2009; You & Leung, 2012). There has however also been some inconsistency in results, depending among other things on how

impulsivity is conceptualized (Glenn & Klonsky, 2010a; Janis & Nock, 2009). Glenn and Klonsky (2010a) found that it was mainly urgency, defined as “a tendency to engage in rash behaviors in the face of negative affect” (p. 72), that differed between groups. Compared to self-report, behavioral measures of impulsivity have not found significant differences between NSSI and non-NSSI groups (Glenn & Klonsky, 2010a; Janis & Nock, 2009).

Psychological characteristics

Adolescents and young adults with NSSI endorse higher levels of negative affect and find it more difficult to regulate intense emotions and tolerate distress (Andover et al., 2005; Gratz & Romer, 2008; Klonsky et al., 2003; Klonsky & Muehlenkamp, 2007; Laye-Gindhu & Schonert-Reichl, 2005; Najmi, Wegner, & Nock, 2007). Adolescents with NSSI show higher levels of physiological reactivity when confronted with a stressful task and evince signs of problem-solving deficits (Nock & Mendes, 2008). In addition there is also support for higher levels of self-derogation among individuals with NSSI (Klonsky et al., 2003; Klonsky & Muehlenkamp, 2007), as well as low self-esteem (Laye-Gindhu & Schonert-Reichl, 2005; Lundh et al., 2007). In this context the link between BPD and self-injury can also be understood, since the two have underlying features of negative emotionality and emotion dysregulation (Klonsky & Muehlenkamp, 2007).

Neurobiological mechanisms

It has been suggested that abnormalities in the serotonergic system, the endogenous opioid system (EOS) and the dopaminergic system play a part in the expression of NSSI, as has the hypothalamic-pituitary-adrenal axis and possible genetic factors (Osuch & Payne, 2009; Sher & Stanley, 2009). The EOS in particular has been a special focus of interest in the study of NSSI. Individuals with NSSI have been shown to have lower resting levels of the opioid types β -endorphin and enkephalins compared to individuals without NSSI (Bresin & Gordon, 2013b; Stanley et al., 2010). Another hypothesis that has been put forward is that repeated exposure to childhood abuse habituates the individual to high levels of endogenous opioids (Sher & Stanley, 2009). Another biological approach was taken by Plener, Bubalo, Fladung, Ludolph, and Lulé (2012) who, using functional magnetic resonance imaging, found support for altered emotion processing with differences in arousal between female adolescents with and without NSSI when viewing emotional and NSSI pictures.

Mediating factors

During recent years individual factors have been suggested to mediate the relationship between maltreatment and self-injury. By examining proximal mediating factors, our understanding of the pathways that underlie the development of NSSI in adolescents and young adults has been expanded. Different factors have been found to mediate the relationship between maltreatment and self-injury, such as alexithymia (Paivio & McCulloch, 2004; Swannell et al., 2012), posttraumatic stress (Shenk, Noll, & Cassarly, 2010), especially in relation to sexual abuse (Weirich & Nock, 2008) and dissociation (Swannell et al., 2012), also in relation to sexual abuse in particular (Kisiel & Lyons, 2001; Rallis et al., 2012; Yates et al., 2008). Self-criticism was found to statistically mediate the relationship between emotional abuse during childhood and engagement in NSSI during adolescence (Glassman et al., 2007). Furthermore, emotion regulation mediated the relationship between attachment style and NSSI (Kimball & Diddams, 2007). Thus, the mechanisms whereby environmental factors, such as child maltreatment, are related to NSSI can be better understood by also examining the proximal mediating effect of individual psychopathology, such as trauma symptoms (Smith, Kouros, & Meuret, 2014).

The Functions of NSSI

To most people NSSI seems puzzling and, to some, even provoking. Why would anyone deliberately engage in an obviously harmful behavior? One way of improving our understanding is by examining the functions of NSSI. Unfortunately, there are many reinforcing contingencies in NSSI. If there were not, the behavior would not be so common and challenging to treat. Many clinical anecdotes have borne witness to how hard adolescents have struggled to give up NSSI, despite being committed to such an end. Investigating the functions of NSSI takes us one step closer to treating the behavior. The functions of NSSI have most commonly been assessed through self-report and interviews with adolescents and adults (Klonsky, 2007). Laboratory settings have also been used with experimental support (Franklin et al., 2010; Haines, Williams, Brain, & Wilson, 1995; Knowles & Townsend, 2012), and ecological momentary assessment measures have contributed less biased information as to why people resort to NSSI (Nock, Prinstein, & Sterba, 2009).

Research into the functions of NSSI has been complicated by the use of different terminologies and perspectives. Terms such as reasons, motives, motivations, reinforcement, purposes and functions have been used, sometimes interchangeably, but with a slightly different meaning. Some of the given explanations of why individuals engage in NSSI also lack empirical support (Lloyd-Richardson, Nock, & Prinstein, 2009; Messer & Fremouw, 2008). The functions also differ depending on the conceptualization of the self-injury. The large study Child and Adolescent Self-Harm in Europe (CASE), for example, does not exclude behaviors performed with suicidal intent and “I wanted to die” is one of eight reported reasons for self-harm among adolescents (Scoliers et al., 2009). In all likelihood NSSI serves several functions simultaneously, or perhaps sequentially (Klonsky, 2007; Lloyd-Richardson et al., 2007, 2009; Nixon et al., 2002), which are not mutually exclusive (Klonsky & Muehlenkamp, 2007). Theories on the functions of NSSI have emphasized both intrapersonal and interpersonal functions. The term intrapersonal or automatic refers to functions aimed at altering an individual’s internal state (emotions, thoughts and physical sensations), whereas the term interpersonal or social refers to functions that aim to change the external environment (Turner, Chapman, & Layden, 2012), for example withdrawal of demands or increased social support.

The emotion regulation function has gained most empirical support, both in adult and adolescent populations, and is consistently the most commonly reported function of NSSI (Brown et al., 2002; Chapman & Dixon-Gordon, 2007; Darosh & Lloyd-Richardson, 2013; Klonsky, 2007, 2009; Laye-Gindhu & Schonert-Reichl, 2005; Polk & Liss, 2009; Rodav et al., 2014; Rodham, Hawton, & Evans, 2004; Sadeh et al., 2014; Suyemoto, 1998). NSSI is usually preceded by negative emotions, such as anger, anxiety, frustration, sadness, loneliness and negative feelings toward self (Klonsky, 2009; Klonsky & Muehlenkamp, 2007; Laye-Gindhu & Schonert-Reichl, 2005), and NSSI helps to regulate such distressing emotional experiences (Chapman & Dixon-Gordon, 2007; Chapman, Gratz, & Brown, 2006; Gratz, 2003; Nock et al., 2009; Selby & Joiner, 2009). When measuring the functions of NSSI, affect regulation is usually expressed in items such as: “to stop bad feelings”, “reducing anxiety, frustration, anger, or other overwhelming emotions”, “to release unbearable tension”, “to help me escape from uncomfortable feelings or moods” (Cloutier & Nixon, 2003; Klonsky & Glenn, 2009; Lloyd, Kelley, & Hope, 1997; Martin et al., 2013). Self-punishment is another common function of NSSI (Brown et al., 2002; Klonsky, 2011; Klonsky & Muehlenkamp, 2007; Laye-Gindhu & Schonert-Reichl, 2005; Lloyd-Richardson et al., 2007; Nixon et al., 2002; Rodav et al., 2014; Sadeh et al., 2014; Swannell, Martin, Scott, Gibbons, & Gifford, 2008). Furthermore, some individuals who engage in NSSI struggle with experiences of feeling unreal or having a lack of feelings (Klonsky & Muehlenkamp, 2007), and a feeling-generation function of NSSI (sometimes referred to as anti-dissociation) with the aim of interrupting these states is also prevalently reported (Glenn &

Klonsky, 2010b; Klonsky, 2011; Nixon et al., 2002; Nock & Prinstein, 2004; Penn, Esposito, Schaeffer, Fritz, & Spirito, 2003; Selby & Joiner, 2009; Turner et al., 2012). Other descriptions of this function are: “to relieve feeling ‘numb’ or empty”, “to feel something, even if it was pain”, “making sure I am still alive when I don’t feel real” (Klonsky & Glenn, 2009; Lloyd et al., 1997). To resist urges to commit suicide, referred to as an antisuicide function, has also been reported (Klonsky, 2007; Klonsky & Muehlenkamp, 2007) in items such as “putting a stop to suicidal thoughts”, “to stop me from acting out ideas of killing myself” (Cloutier & Nixon, 2003; Klonsky & Glenn, 2009; Martin et al., 2013). Both the feeling-generation and the antisuicide function are hypothesized to be related to the emotion regulation function (Klonsky & Muehlenkamp, 2007).

Social/interpersonal functions of NSSI have also been described in studies of adolescent samples (Hilt, Cha, et al., 2008; Hilt, Nock, et al., 2008; Nock & Prinstein, 2004, 2005; Rodav et al., 2014; Sadeh et al., 2014). Lloyd-Richardson et al. (2007) found that adolescents in a community sample reported engaging in NSSI to influence others as commonly as for emotion regulation purposes. However, social functions have not received as much attention as affect regulation in the literature, and are not generally reported as often in clinical or adult samples (e.g., Brown et al., 2002; Klonsky, 2011). Nock (2008) and Hagen, Watson, and Hammerstein (2008) have elaborated on the social functioning of NSSI. They argued that people escalate to NSSI as a means of influencing others when less drastic forms of communication have not been successful. In this context the behavior can be regarded as an adaptive form of self-help. This view is supported by research showing that adolescents with NSSI reported improvement in the relationship with their fathers over time (Hilt, Nock, et al., 2008). Examples of social functions include to receive help and to be noticed, to communicate desperation, to avoid interpersonal demands, revenge and also bonding with peers (Kaess et al., 2013; Klonsky & Glenn, 2009; Klonsky & Muehlenkamp, 2007; Nock & Prinstein, 2004). Yet another function of NSSI that appears in the literature is sensation seeking, where the aim is “to provide a sense of excitement that feels exhilarating” (Cloutier & Nixon, 2003; Klonsky & Muehlenkamp, 2007; Martin et al., 2013; Rodav et al., 2014). Furthermore, the issue of control is described as a function of NSSI: “to have control in a situation where no one can influence me”, “to get control of a situation” (Lloyd et al., 1997; Nixon et al., 2002).

Some studies have shown that girls are more prone to engage in NSSI to punish themselves (Laye-Gindhu & Schonert-Reichl, 2005; Lloyd-Richardson et al., 2007) and that more boys than girls report reasons such as boredom, to join a group, or because they thought it would be fun (Laye-Gindhu & Schonert-Reichl, 2005). Comparisons between adolescents affected by NSSI and those not affected revealed that adolescents who had never exhibited NSSI tended to believe that NSSI is mostly interpersonally motivated. However, adolescents affected by NSSI assessed the intrapersonal functions as more appropriate (Rauber, Weizenegger, Schmeck, & Schmid, 2012). Similarly, in a study among patients and staff in a residential treatment center in Sweden, staff reported that the adult women had more interpersonal reasons for their NSSI than the women themselves reported, and that the women instead emphasized the intrapersonal functions of the behavior (Lindholm, Bjärehed, & Lundh, 2011).

Learning theory

Some researchers (e.g., Nock, 2009, 2010; Nock & Prinstein, 2004; Lloyd-Richardson et al., 2009) argue that in order to enable empirical testing, views on NSSI functions have to be more specific and that the functions need to be approached through learning theory. According to learning theory, a functional approach to NSSI requires the behavior to be analyzed and treated according to its immediate internal and external contingencies (Nock, 2010; Nock & Prinstein, 2004). In the words of Suyemoto (1998): “...why this particular behavior, at this particular time, to serve this particular function, for this particular patient...” (p. 537). The antecedents and consequences of NSSI are thus analyzed in order to examine in which context the

behavior is likely to be reinforced. NSSI is in all likelihood maintained by several reinforcing processes (Nock, 2009). Based on the framework of learning theory, Nock and Prinstein (2004) developed a four-function model (FFM) of NSSI. The four functions are: automatic negative reinforcement (ANR, such as: “to relieve feeling ‘numb’ or empty”), automatic positive reinforcement (APR, such as: “to feel something, even if it was pain”), social negative reinforcement (SNR, such as: “to avoid having to do something unpleasant you don’t want to do”), and social positive reinforcement (SPR, such as: “to try to get a reaction from someone, even if it’s a negative reaction”). A positive reinforcement contingency means that a certain behavior (NSSI) is followed by a favorable stimulus, thus increasing the likelihood of repeated NSSI in a similar context. Negative reinforcement describes a contingency where NSSI is performed in the presence of an aversive stimulus and engaging in NSSI decreases the aversive state, increasing the likelihood of the behavior recurring.

The underlying factor structure of the functions of NSSI

The Functional Assessment of Self-Mutilation (FASM) assesses a range of functions of NSSI (Lloyd et al., 1997). Nock and Prinstein (2004) conducted a confirmatory factor analysis (CFA) based on the FFM in a clinical sample of 89 adolescents, aged 12-17 years, and results showed a good fit for the four-factor model. In their study they showed that adolescents engaged in NSSI for a variety of reasons that are consistent with learning theory, thus providing empirical support for a functional model of NSSI. The results of Nock and Prinstein’s (2004) FFM were later confirmed by a CFA by Lloyd-Richardson et al. (2007) in a community sample of adolescents ($n = 261$). Other factor analyses on the functions of NSSI have also shown support for underlying social/interpersonal and intrapersonal/automatic factors (Klonsky & Glenn, 2009). In a recent study by Leong, Wu, and Poon (2014), FASM was administered to Chinese adolescents ($n = 345$), and a CFA was performed to confirm Nock and Prinstein’s (2004) FFM. The original FFM did not reach adequate fit and a latent C-FASM factor was therefore added to the model and 11 residuals were set to correlate to improve the model fit. Another study on the underlying factors of FASM functions of NSSI, conducted by Kaess et al. (2013) on clinical adolescents ($n = 65$) in Germany, was unable to confirm a differentiation between positive and negative reinforcement as postulated by Nock and Prinstein (2004). Kaess et al. (2013) instead found support for a three-factor solution: “interpersonal influence”, “automatic functions” and “peer identification”, similar to a later factor analysis on FASM by Young et al. (2014).

In the light of recent recognition of peer influence in adolescent NSSI (Prinstein, Guerry, Browne, & Rancourt, 2009; Prinstein et al., 2010), a separate peer identification factor is an interesting finding. Mounting evidence suggests that adolescent NSSI is a behavior susceptible to peer influence, particularly among vulnerable individuals (Jarvi et al., 2013). Studies on community samples of adolescents have shown that adolescents’ NSSI could be predicted by their best friend’s NSSI, even when the effects of depressive symptoms were controlled for (Prinstein et al., 2010; You, Lin, & Leung, 2013). The results in the study by Prinstein et al. (2010) suggested that socialization effects were most common among girls and younger adolescents. Nock and Prinstein (2005) further showed that more than 82% of psychiatric inpatient adolescents reported having a close friend who also engaged in similar behaviors. It seems as though engaging in the same sort of health risk behaviors as friends or high-status peers may result in feelings of affiliation with others who engage in NSSI, which can serve as contingencies that provide social reinforcement for NSSI among certain individuals. Research thus suggests that peer identification is a factor that also needs to be taken into account when assessing functions of NSSI among adolescents.

Debate on underlying factors

In the literature on NSSI functions, two, three and four underlying factors have thus all been discussed. One of the issues at hand concerns whether the automatic functions are distinct

(Bentley, Nock, & Barlow, 2014; Selby, Nock, & Kranzler, 2014) and can be divided into separate APR and ANR. Klonsky (2009), for example, postulates that self-injury is mainly associated with reductions in negative affect rather than increases in positive affect, and more likely to be negatively reinforced, a perspective also endorsed by Chapman et al. (2006). There are still some uncertainties as to what sensation is generated and what exactly is meant by APR. Is it pain, sensation or excitement (Selby et al., 2014)? Selby et al. (2014) have suggested a definition: “an instance of NSSI that was engaged in specifically to “feel” a sensation, such as to feel stimulation, satisfaction, or pain” (p. 2) and argues that although the specific sensation can vary, for example, pain or relaxation, some kind of positive reinforcement is involved in NSSI. Another subject for discussion is whether a two-factor model represents a more parsimonious explanation of the mechanisms involved when an individual engages in NSSI, compared to models with several factors. Furthermore, there are differences in the way functions are defined: as specific antecedents and consequences that cause and maintain NSSI within the framework of learning theory or by using a broader concept of reasons and motives. Researchers have also placed a slightly different emphasis on the role that social functions play in NSSI (Bentley et al., 2014; Chapman et al., 2006; Klonsky, 2007, 2009; Nock & Prinstein, 2004, 2005). Some view social/interpersonal functions not as primary goals of NSSI, while nevertheless considering that NSSI can be reinforced by the elicitation of caring responses (e.g., Gratz, 2003). Similarly, the primary or secondary value of the functions has also been discussed, for example with regard to self-punishment, where Klonsky (2007) suggests that it might be secondary to emotion regulation. Despite these ongoing discussions, there is general agreement that functions provide crucial information concerning the mechanisms of NSSI and warrant further investigation.

A specific distress – function relationship

It is important to understand the context in which the need to use NSSI to regulate emotional and social experiences is developed and maintained. It is generally thought that invalidating and insensitive caregiving environments have a detrimental effect on children’s development, rendering them vulnerable and making it difficult for them to reflect on affective experiences, for example, or to use language to describe and share inner states with others. In this context NSSI can function as a compensatory regulatory strategy (Yates, 2004; Yates et al., 2008). During recent years research has moved beyond general descriptions of NSSI functions and begun to examine more specific relationships between psychosocial variables and the functions of NSSI, lending support to the validity of the function model of automatic/intrapersonal and social/interpersonal functions of NSSI.

According to prior research, engaging in NSSI for automatic/intrapersonal reasons has most clearly been associated with symptoms of depression, posttraumatic stress and dissociation (Hilt, Cha, et al., 2008; Klonsky & Glenn, 2009; Kumar et al., 2004; Nock & Prinstein, 2005; Rallis et al., 2012), self-criticism (Glassman et al., 2007), sexual abuse (Kaess et al., 2013; Kumar et al., 2004; Rallis et al., 2012; Yates et al., 2008), emotional abuse (Rallis et al., 2012), thought and expressive suppression (Najmi et al., 2007; Turner et al., 2012), physiological arousal (Nock & Mendes, 2008), suicide ideation (Klonsky & Glenn, 2009) and suicide attempts (Nock & Prinstein, 2005). Some studies have found that females were more likely than males to engage in NSSI for intrapersonal reasons (Klonsky & Glenn, 2009; Kumar et al., 2004), especially to punish oneself (Laye-Gindhu & Schonert-Reichl, 2005; Lloyd-Richardson et al., 2007). Social functions, on the other hand, have been associated with interpersonal distress (Hilt, Cha, et al., 2008), social perfectionism and social concerns (Nock & Prinstein, 2005) and paternal antipathy (Kaess et al., 2013), and negatively associated with expressive suppression (Turner et al., 2012). Recurrent NSSI has been found to be associated with intrapersonal motives for self-injurious behaviors (Yates et al., 2008). Turner et al. (2012) similarly found an association between NSSI lifetime frequency and automatic/intrapersonal functions, but not interpersonal functions, and Klonsky and Olino (2008) found one group of severe self-injurers that mainly reported automatic

functions. Other studies have found that more severe NSSI and higher scores on clinical measures have been related to more overall reported functions, both social and automatic (Klonsky & Glenn, 2009; Lloyd-Richardson et al., 2007). Examining function-specific correlates contributes knowledge of possible pathways as to how environmental adversities and individual factors may influence an individual to engage in NSSI to achieve specific goals, such as emotion regulation and/or influencing others, taking us an important step further toward developing functionally relevant interventions for NSSI (Bentley et al., 2014) which are still at an early stage (Klonsky & Muehlenkamp, 2007).

How does NSSI regulate emotion?

Why do people turn to NSSI and not to other functionally equivalent behaviors? Some researchers emphasize the addictive features of NSSI. Nixon et al. (2002), for example, found that a majority of the self-harming adolescents in their study reported frequent urges to self-harm, almost on a daily basis, and particularly so after the occurrence of a perceived stressor, and many endorsed several of the addictive criteria for substance dependence in DSM. The urge to self-injure in adolescents has further been examined by Washburn, Juzwin, Styer, and Aldridge (2010). That NSSI is preceded by a preoccupation that is difficult to resist is also a suggested criterion of NSSI in DSM-5 section III (APA, 2013). Although the urge aspect of NSSI suggests similarities between addictions such as substance abuse and NSSI, Victor et al. (2012) found important differences in this matter in a clinical sample of adolescent inpatients. Cravings for substance use were stronger than for self-injury, and while substance use occurred during both negative and positive affect, self-injury was only craved for in the context of negative emotions, emphasizing the emotion regulation functions of negative reinforcement in NSSI (Victor et al., 2012).

A hypothesis of self-punishment has also been suggested as to why people turn specifically to NSSI (Nock, 2009, 2010). According to the principles of self-verification (Swann, Hixon, Stein-Seroussi, & Gilbert, 1990), people tend to behave in ways that are consistent with their basic beliefs about themselves. When these basic beliefs are disconfirmed, people experience an aversive state of tension. When an individual experiences intense self-loathing, the act of cutting oneself may thus lead to self-confirming feedback and a relief from tension. Individuals with self-injury endure pain for longer time and have higher pain thresholds than non-injurers, and this has shown to be predicted by high levels of self-criticism (Hooley, Ho, Slater, & Lockshin, 2010). In this context a recent study with an experimental design by Hooley and St. Germain (2014) found that pain endurance could be reduced in self-injuring individuals who underwent a cognitive intervention aimed at increasing a sense of self-worth.

Another possible mechanism that can explain how NSSI regulates emotion is through distraction (Chapman et al., 2006). Physical stimulation (pain) diverts the individual's attention from the emotional arousal. Methods of distraction that are less intense, such as talking to a friend, are not as successful in regulating intense negative affective states as are stronger sensations, such as pain (Selby & Joiner, 2009). The chemical processes involved in NSSI (stress hormones, endogenous opioids, and inflammatory and immune processes) affect the brain and alter aversive states more effectively than taking a shower, for example (Osuch & Payne, 2009). Along these lines, Bresin, Gordon, Bender, Gordon, and Joiner (2010) and Franklin et al. (2010) showed that negative affect decreased following a pain experience. Furthermore, painful sensations, compared to non-painful sensations, lead to a larger decrease in negative affect for individuals with NSSI (Bresin & Gordon, 2013a). It has been shown that repeated NSSI activates the endogenous reward neurocircuitry (Bresin & Gordon 2013a, 2013b; Osuch & Payne, 2009; Sher & Stanley, 2009; Stanley et al., 2010): "Since endogenous opioids are involved in reward and the regulation of pain and affect, it seems likely that this system is a possible mechanism of affect regulation in NSSI" (Bresin & Gordon, 2013b, p. 376). A unique aspect of NSSI compared to many other

functionally equivalent behaviors is the role of blood. Several individuals with NSSI have claimed that seeing blood while engaging in NSSI was important as it was comforting and relieved tension (Favazza & Conterio, 1989; Glenn & Klonsky, 2010b; Selby & Joiner, 2009).

Theoretical Models of NSSI

There has previously been a lack of evidence-based theoretical models to explain NSSI in a wide range of populations, including adolescents, outside the BPD context. Different models have been presented, but with a different amount of empirical support (Messer & Fremouw, 2008; Suyemoto, 1998). One theoretical model of the etiology of BPD is the biosocial theory (Crowell, Beauchaine, & Linehan, 2009; Linehan, 1993), which has been expanded to include the specific understanding of NSSI in individuals with BPD (the Emotional Cascade Theory; Selby, Anestis, Bender, & Joiner, 2009; Selby & Joiner, 2009), and across different populations (the Experiential Avoidance Model [EAM]; Chapman et al., 2006). The theoretical models that have evolved during the last decade stress (neuro)biological, psychological and social perspectives with environmental factors such as abuse, neglect, loss, conflict and criticism in, above all, the caregiving environment. These factors are assumed to interact with individual vulnerabilities in affective, cognitive and behavioral domains, such as deficits in emotion regulation and interpersonal skills, alongside symptoms such as depression, dissociation, posttraumatic stress, alexithymia, and also neurobiological factors, mainly the EOS and the serotogenic and dopamine systems. The complex interplay between these biopsychosocial factors (D'Onofrio, 2007; Heath & Nixon, 2009; Walsh, 2006) is fundamental to our understanding of both the development and the maintenance of NSSI.

Yates' (2004, 2009) model of developmental psychopathology conceptualizes NSSI as an adaptation to childhood traumatic stress. Yates (2004) suggested that experiences of family maltreatment may undermine individuals' adaptive abilities in multiple domains and that self-injury is a compensatory regulatory and relational strategy in individuals that have vulnerabilities in emotional and relational levels of competence (Yates, 2004).

The EAM (Chapman et al., 2006) emphasizes the emotion regulation skill deficits in understanding NSSI (Gratz, 2006; Gratz & Roemer, 2008) and views it as a negatively reinforced behavior, performed with the aim of reducing unwanted experiences (see Figure 1). NSSI is conceptualized as a broader class of experiential avoidance behavior, including any behavior that functions to avoid or escape unwanted experiences within the individual or external triggers (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996). Although NSSI can have negative consequences in the long run, the immediate escape conditioning maintains NSSI. Gratz and Roemer (2008) have stressed the importance of emotion regulation skill deficiencies in understanding the connection between abuse and NSSI. Early maltreatment and less optimal upbringing experiences are thought to influence the capacity for emotion regulation, stress tolerance and communication skills, increasing the need for NSSI as a coping behavior.

THE EXPERIENTIAL AVOIDANCE MODEL (EAM) OF DELIBERATE SELF-HARM

Figure 1. Graphic depiction of the Experiential Avoidance Model (EAM) of deliberate self-harm (DSH). In: Chapman, A. L., Gratz, K. L., & Brown, M. Z. (2006). Solving the puzzle of deliberate self-harm: The experiential avoidance model. *Behaviour Research and Therapy*, 44, 371-394. Reprinted with permission from the authors.

The latest model proposed is the integrated theoretical model for the development and maintenance of NSSI (Nock, 2009). According to this model, NSSI is maintained through its effective regulation of unbearable emotional and cognitive experiences, as well as regulating social situations, for example by communicating with others and influencing other people's responses (see Figure 2). It further posits that the risk for NSSI is increased by distal risk factors (such as abuse or familial criticism). These early experiences make individuals vulnerable with deficits in affective regulation and interpersonal skills. This leads to difficulties handling stressful events and increases the likelihood of ineffective responses to stress, increasing the risk for NSSI. In his model Nock argues that the presented risk factors would predispose individuals to a number of psychopathologies, and he puts forward different hypotheses as to which mechanisms can lead an individual to engage in NSSI specifically, rather than other functionally equivalent behaviors. Nock argues that social learning is one such mechanism, for example learning about NSSI from friends, media, or the Internet. Another is self-punishment, where cutting in particular has shown to be an effective way to achieve this end, and also social signaling, where NSSI is a highly efficient means of signaling distress to others. Pragmatism is another NSSI-specific hypothesis; NSSI is easily attainable, possibly making it especially attractive for youngsters. NSSI effectively reduces emotional pain, most probably through the EOS system, which makes it the method of choice for some individuals. For some people NSSI becomes a lifestyle and they build an identity as a self-injurer. NSSI is thus, also in this model, viewed as a form of coping behavior, regulating affective and social experiences (Nock & Prinstein, 2005).

Figure 2. An integrated theoretical model of the development and maintenance of nonsuicidal self-injury (NSSI). In: Nock, M. K. (2009). Why do people hurt themselves? New insights into the nature and functions of self-injury. *Current Directions in Psychological Science*, 18, 78-83. Reprinted with permission from the author.

Specific Psychological Treatment

Evidence-based treatment protocols that target NSSI in adolescents are scarce (Muehlenkamp, 2006; Washburn et al., 2012). The most often referred treatments are Mentalization Based Treatment for Adolescents (MBT-A) (Laurensen et al., 2014; Rossouw, 2013; Rossouw & Fonagy, 2012) and Dialectical Behavior Therapy for Adolescents (DBT-A) (Fleischhaker et al., 2011; Katz, Cox, Gunasekara, & Miller, 2004; MacPherson, Cheavens, & Fristad, 2013; McDonell et al., 2010; Miller, Rathus, & Linehan, 2007; Rathus & Miller, 2002; Tørmoe et al., 2014). However, these methods are extensive, not always feasible in clinical practice and treat NSSI in a BPD context. There is therefore a need for shorter treatments aimed specifically at NSSI (Glenn & Klonsky, 2013).

Previously, one study of developmental group therapy for adolescents showed promising results with a reduction in self-harm compared to treatment as usual (Wood, Trainer, Rothwell, Moore, & Harrington, 2001), but it has not been possible to replicate the results (Green et al., 2011; Hazell et al., 2009). Other NSSI-specific pilot studies for adolescents have involved music therapy (Plener, Sukale, Ludolph, & Stegemann, 2010) and acupuncture (Nixon, Cheng, & Cloutier, 2003). One study also tested a school-based prevention program (Muehlenkamp, Walsh, & McDade, 2010) aimed at increasing knowledge about NSSI and help-seeking behaviors and reducing NSSI among adolescents. There are some examples of shorter treatment programs for adolescents presently in progress outside the BPD context: the Cutting Down Program, a cognitive behavioral treatment package, where a large research study is in progress (Fischer, Brunner, Parzer, Resch, & Kaess, 2013), and Interpersonal Psychotherapy for Depressed Adolescents Adapted for Self-Injury (IPT-ASI; Jacobson & Mufson, 2012) which treats NSSI

within an interpersonal framework. In Sweden as a part of the national self-injury project there is currently a pilot study of Emotion Regulation Group Therapy (ERGT; Gratz & Gunderson, 2006; Gratz, Tull, & Levy, 2013), adjusted for individual treatment with adolescents (ERITA), focusing on emotional awareness, emotion regulation, acceptance and goal-directed behavior. Research on family treatments has mostly focused on suicidal behaviors in general, and has not separated NSSI from suicidal behaviors (Brent et al., 2013). Attachment Based Family Therapy (ABFT; Diamond et al., 2010), for example, has showed promising results for reducing suicidal ideation in adolescents, but has not specifically had NSSI as an outcome measure. Treatment trials for depressed adolescents that have separated NSSI from suicidal behaviors, such as the Treatment of SSRI-Resistant Depression in Adolescents (TORDIA) and the Adolescent Depression Antidepressants and Psychotherapy Trial (ADAPT) have shown limited effectiveness in reducing NSSI (Brent et al., 2008; Wilkinson et al., 2011).

The literature on pharmacological treatment for adolescent NSSI focuses mainly on the serotogenic, dopamine and endogenous opioid systems and is as yet limited in scope (Cullen, Westlund, LaRiviere, & Klimes-Dougan, 2013; Plener, Libal, & Nixon, 2009).

Instruments for Measuring NSSI

As the need grew to measure and assess NSSI for research purposes and in clinical practice, methods to this end began to be developed towards the end of the 1990s. Psychometrically, however, instruments for measuring NSSI are just beginning to be developed (Cloutier & Humphreys, 2009). Most instruments have been developed in English-speaking countries and have to undergo the procedure of translation and psychometric testing in the countries and populations where they are to be used.

The most comprehensive instruments are the semi-structured interviews Suicide Attempt Self-Injury Interview (SASII; Linehan, Comtois, Brown, Heard, & Wagner, 2006) and Self-Injurious Thoughts and Behaviors Interview (SITBI; Nock, Holmberg, Photos, & Michel, 2007). While SASII has mainly been used on adult borderline populations, SITBI has been used on adolescent samples with good psychometric properties (Nock et al., 2007) and is generally agreed to be a recommended measure of NSSI (Cloutier & Humphreys, 2009; Klonsky & Weinberg, 2009). There is also a shorter self-report version of SITBI, which has been used by Muehlenkamp, Walsh, et al. (2010). Self-report instruments of NSSI are often divided into syndromal or functional measures. One example of a syndromal self-report measure that has been used on adolescents is The Deliberate Self-Harm Inventory (DSHI; Gratz, 2001), which is a widespread instrument. It has been translated into Swedish, and a revised 9-item version especially adjusted for adolescents has been tested psychometrically (Bjärehed & Lundh, 2008; Lundh et al., 2007), and used in a later Swedish study (Odelius & Ramklint, 2014b). The Self-Harm Behavior Questionnaire (SHBQ; Gutierrez, Osman, Barrios, & Kopper, 2001) is another syndromal measure which has been used on adolescents. SHBQ measures frequency, severity and context and has been tested psychometrically (Gutierrez et al., 2001; Muehlenkamp, Cowles, & Gutierrez, 2010) and has spread to other countries.

Other measures are both syndromal and functional: the Functional Assessment of Self-Mutilation (FASM; Lloyd et al., 1997), the Inventory of Statements About Self-Injury (ISAS; Klonsky & Glenn, 2009), and the Ottawa Self-Injury Inventory (OSI; Cloutier & Nixon, 2003; Martin et al., 2013), all of which have been used in several studies on samples of adolescents and young adults, with psychometric data available to support their usage. NSSI behaviors are usually described in a checklist format, where participants endorse whether they have engaged in any of the mentioned behaviors during their lifetime or the previous year, and also the number of times. The

number of NSSI items mentioned varies between instruments, but is usually in the 10-20 range (Gratz, 2001; Klonsky & Glenn, 2009; Lloyd et al., 1997). Examples of NSSI behaviors that are often included are cutting, hitting self, burning, pulling out hair, biting, scratching, interfering with wound healing and inserting objects under skin and/or nails. A more rarely included item is breaking bones (e.g., DSHI, OSI). Some measures also include the item swallowing substances (e.g., ISAS, OSI). The issue of suicidal intent is addressed differently across measures. Some clarify it in the introduction (e.g., OSI, ISAS), others, such as the Non-suicidal Self-Injury Assessment Tool (NSSI-AT; Whitlock et al., 2014), an online measure used on college populations, do not ask about suicidal intent directly but it is screened for in the function items. DSHI has only specified the wording “without suicide intent”, in the cutting item. Several measures also provide contextual information regarding pain, age of debut, medical treatment, body areas affected, time lapse between the urge and actually engaging in NSSI.

Measurement of the functions and underlying factor structures of NSSI

Several instruments assess the functions of NSSI. Some instruments include both suicidal and non-suicidal self-injury, which naturally enough will influence the functions, due to difference in intent between these phenomena. The lists of functions of NSSI included in the functional measures vary (Cloutier & Humphreys, 2009; Klonsky & Weinberg, 2009), and also the populations they have been used on. Some instruments and functions have mainly been developed and used within an adult BPD context (e.g., SASII), while others focus on adolescents (e.g., FASM). The various examples of functions listed in the instruments have usually been developed from a combination of literature review, input from individuals with self-injury and clinical experience. Since lists of functions are usually quite extensive, several researchers have performed factor analyses to explore or confirm whether the functional items of NSSI can be reduced to underlying factors. Table 2 presents an overview of self-report instruments that measure the functions of NSSI and the underlying factor structures.

Table 2

Overview of Self-Report Measures of SIB Functions and Underlying Factor Structure

Self-report measure	Factor analysis	Psychometrics	Sample size	Type of SIB*	Age group	Type of sample	No. of factors	No. of function items	Underlying factors	Examples of function items
CASE-study	PCA Scoliers et al. (2009)	Cry for help: $\alpha = .64$; explained variance: 26% Cry of pain: $\alpha = .28$; explained variance: 16%	2,325	DSH	Adolescents	Community Australia & Europe	2	8	Cry for help: 5 items Cry of pain: 3 items	"I wanted to find out whether someone really loved me" "I wanted to get relief from a terrible state of mind"
FASM	CFA Nock & Prinstein (2004)	ANR: $\alpha = .62$ APR: $\alpha = .69$ SNR: $\alpha = .76$ SPR: $\alpha = .85$	89	NSSI	Adolescents	Clinical USA	4	22 (1 item excluded = 21)	ANR: 2 items APR: 3 items SNR: 4 items SPR: 12 items	"To stop bad feelings" "To punish yourself" "To avoid school, work, or other activities" "To get control of a situation"
	CFA Lloyd-Richardson et al. (2007)		261	NSSI	Adolescents	Community USA	4	22	ANR APR SNR SPR	Same as above
	CFA Leong et al. (2014)	ANR: $\alpha = .65$ APR: $\alpha = .44$ SNR: $\alpha = .79$ SPR: $\alpha = .91$	345	NSSI	Adolescents	Community China	Second-order 4-factor model	22 (1 item excluded = 21)	ANR APR SNR SPR	Same as above
	EFA Kaess et al. (2013)	Explained variance: 81%	65	NSSI	Adolescents & young adults	Clinical Germany	3	22 (2 items excluded = 20)	Interpersonal influence: 9 items† Automatic: 6 items† Peer id.: 2 items†	"To make your parents understand you" "To get control of a situation" "To feel more a part of a group"
	PCA Young et al. (2014)	Explained variance: 45%	170	Self-harm	Adolescents	Community Germany	3	22 (2 items excluded = 20)	Interpersonal influence and communication: 8 items Automatic: 7 items Peer avoidance-attraction: 5 items	"To receive more attention from your parents or friends" "To feel something" "To avoid punishment or paying the consequences"

Table 2 Overview of Self-report Measures of SIB Functions and Underlying Factor Structure (Continued)										
Self-report measure	Factor analysis	Psychometrics	Sample size	Type of SIB*	Age group	Type of sample	No. of factors	No. of function items	Underlying factors	Examples of function items
ISAS	EFA Klonsky & Glenn (2009)	Interpersonal: $\alpha = .87$ Intrapersonal: $\alpha = .80$	235	NSSI	Young adults	College USA	2	13	Interpersonal: 8 items Intrapersonal: 5 items	Interpersonal Influence: "Letting others know the extent of my physical pain" Affect regulation: "Calming myself down"
		Social: $\alpha = .86$ Automatic: $\alpha = .81$	529	NSSI	Adolescents	Community Turkey	2	13	Social: 8 items Automatic: 5 items	Same as above
MPQ	PCA Hjelmeland et al. (1998)	Explained variance: 59% Revenge/manipulation: $\alpha = .80$ Escape: $\alpha = .55$	776	DSH	Adults	Clinic Nordic countries	4	14 (3 excluded = 11)	Revenge/manipulation: 3 items Escape: 2 items Seeking attention: 3 items Intention to die: 3 items	"I wanted others to pay for the way they treated me" "I wanted to sleep for a while" "I wanted to show others how desperate I felt" "I wanted to die"
		Seeking attention: $\alpha = .57$ Intention to die: $\alpha = .62$								
	EFA McAuliffe et al. (2007)	Interruption: $\alpha = .65$; explained variance: 30% Revenge: $\alpha = .90$; explained variance: 16% Appeal: $\alpha = .74$; explained variance: 10% Escape: $\alpha = .62$; explained variance: 8%	146	DSH	Adolescents & adults	Accident/emergency department Ireland	4	14	Interruption: 4 items Revenge: 2 items Appeal: 4 items Escape: 4 items	"I wanted to sleep for a while" "I wanted to make someone feel guilty" "I wanted to show someone how much I loved him/her" "My thoughts were so unbearable, I could not endure them any longer"

NSSI-AT	EFA Whitlock et al. (2014)	Affective imbalance, low pressure: $\alpha = .64$, Affective imbalance, high pressure: $\alpha = .60$, Social communication and expression: $\alpha = .38$, Self-retribution and deterrence: $\alpha = .47$, Sensation seeking: $\alpha = .52$	1773	NSSI	Young adults	University USA	5	18	Affective imbalance, low pressure: 4 items Affective imbalance, high pressure: 3 items Social communication and expression: 3 items Self-retribution and deterrence: 4 items Sensation seeking: 4 items	<i>"To cope with uncomfortable feelings"</i> <i>"To relieve stress or pressure"</i> <i>"In hopes that someone would notice that something is wrong or that so others will pay attention to me"</i> <i>"As a self-punishment or to atone for sins"</i> <i>"Because I get the urge and cannot stop it"</i>
OSI	EFA Martin et al. (2013)	Internal emotion regulation: $\alpha = .85$; explained variance: 22% Social influence: $\alpha = .75$; explained variance: 11% External emotion regulation: $\alpha = .80$; explained variance: 6% Sensation seeking: $\alpha = .67$; explained variance: 4%	149	NSSI	Young adults	University sample Canada	4	31 (7 items excluded = 24)	Internal emotion regulation: 8 items Social influence: 9 items External emotion regulation: 3 items Sensation seeking: 4 items	<i>"To stop me from thinking about ideas of killing myself"</i> <i>"To belong to a group"</i> <i>"To release frustration"</i> <i>"To provide a sense of excitement that feels exhilarating"</i>
QNSSI/ SASII	EFA Turner et al. (2012)	Explained variance: 54% Emotion relief: $\alpha = .85$ Feeling generation: $\alpha = .85$ Interpersonal influence: $\alpha = .83$ Interpersonal Communication: $\alpha = .76$ Self-punishment: $\alpha = .66$	162	NSSI	Adults	Community Canada	5	17 QNSSI + items from SASII (6 items excluded)	Emotion relief: 9 items Feeling-generation: 4 items Self-punishment: 3 items Interpersonal communication: 3 items Interpersonal influence: 3 items	<i>"To stop feeling sad"</i> <i>"To feel something, even if it was pain"</i> <i>"To punish myself"</i> <i>"To communicate or let others know how desperate I am"</i> <i>"To get other people to act differently or change"</i>

Table 2 Overview of Self-report Measures of SIB Functions and Underlying Factor Structure (Continued)										
Self-report measure	Factor analysis	Psychometrics	Sample size	Type of SIB*	Age group	Type of sample	No. of factors	No. of function items	Underlying factors	Examples of function items
SHRQ	PCA Lewis & Santor (2008)	Explained variance: 80% Negative mood management: $\alpha = .88$ Distal goal: $\alpha = .91$ Trauma management: $\alpha = .71$ Tension management: $\alpha = .89$ Self-hate: $\alpha = .88$	41	Self-harm	Young adults	University Canada	5	15	Negative mood management: 6 items Distal goal: 2 items Trauma management: 3 items Tension management: 2 items Self-hate: 2 items	"I wanted to feel real" "I wanted to be happy" "I wanted to stop over-whelming and unwanted flash-backs, memories or nightmares" "I wanted to get rid of stress" "To punish myself"
SHRQ-R	PCA Lewis & Santor (2010)	Explained variance: 67% Anti-depression: $\alpha = .82$ Interpersonal communication: $\alpha = .81$ Anti-dissociation: $\alpha = .78$ Self-hate: $\alpha = .75$ Anti-tension: $\alpha = .82$	57	Self-harm	Young adults	Community	5	21	Anti-depression Interpersonal communication Anti-dissociation Self-hate Anti-tension	No information given in the paper by Lewis & Santor (2010)
SIMS	EFA Osuch et al. (1999)	Explained variance: 85% $\alpha = .81 - .93$.	99	NSSI	Adults	Clinical USA	6	35	Affect modulation 9 items Desolation 4 items Punitive duality 6 items Influencing others 5 items Magical control 7 items Self-stimulation 4 items	"To produce feelings and a sense of being real when I feel numb and 'unreal'" "To diminish a feeling of being utterly alone" "To punish myself for positive feelings or experiences" "To express anger at or seek revenge toward others" "To 'protect' important people in my life" "To provide a sense of excitement or stimulation that feels exhilarating"

SIMS-A	EFA Swannell et al. (2008)	Emotion regulation: $\alpha = .85$ Communication to /influencing others: $\alpha = .84$ Punishment/excitement: $\alpha = .80$ Psychoes/lack of insight: $\alpha = .56$	38	NSSI	Adolescents	Clinical Australia	4	20	Emotion regulation: 5 items Communication/ influencing others: 5 items Punishment/ excitement: 5 items Psychoes/ lack of insight: 5 items Affect regulation	<i>"Decrease an empty feeling"</i> <i>"Seek support and caring from others when I don't ask directly"</i> <i>"To experience a high that feels like a drug high"</i> <i>"Satisfy voices inside or outside telling me to do it"</i> <i>"To deal with physical pain instead of mental pain"</i> <i>"To get a reaction"</i> <i>"To avoid suicide"</i> <i>"Fun"</i> <i>"To escape from reality"</i>
SIQ	PCA Santa Mina et al. (2006)	Explained variance: 50% Affect regulation: $\alpha = .74$ Coping: $\alpha = .72$ Protection: $\alpha = .73$ Stimulation: $\alpha = .76$ Dissociation: $\alpha = .76$	83	Self- harm	Adults	Clinical Canada	5	30	Coping Protection Stimulation Dissociation	

Note. ANR = automatic negative reinforcement, APR = automatic positive reinforcement, CASE = Child and Adolescent Self-Harm in Europe (Scoliers et al., 2009), CFA = confirmatory factor analysis, DSH = deliberate self-harm, EFA = exploratory factor analysis, FASM = Functional Assessment of Self-Mutilation (Lloyd et al., 1997), ISAS = Inventory of Statements About Self-Injury (Klonsky & Glenn, 2009), MPQ = Motives for Parasuicide Questionnaire (Kerhof et al., 1993), NSSI = non-suicidal self-injury, NSSI-AT = Non-Suicidal Self-Injury - Assessment Tool (Whitlock et al., 2014), OSI = Ottawa Self-Injury Inventory (Cloutier & Nixon, 2003), PCA = principal component analysis, QNSSI = Questionnaire for Non-Suicidal Self-Injury (Kleindienst et al., 2008), SASII = Suicide Attempt Self-Injury Interview (Linehan et al., 2006), SHRO = Self-Harm Reason Questionnaire (Lewis & Santor, 2010), SHRO-R = Self-Harm Reason Questionnaire Revised (Lewis & Santor, 2010) SIB = self-injurious behavior, SIMS = Self-Injury Motivation Scale (Osuch et al., 1999), SIMS-A = Self-Injury Motivation Scale - Adolescent version, SIQ = Self-Injury Questionnaire (Alexander, 1999) SNR = social negative reinforcement, SPR = social positive reinforcement, *Deliberate self-harm includes behaviors both with and without suicidal intent, †3 items not included due to unique loadings.

Ethical Issues

As with other sensitive issues, collecting prevalence data on NSSI in adolescence has its challenges (Taylor et al., 2011). NSSI often emerges in adolescence and it is therefore essential that research is conducted on this age group (Taylor et al., 2011). At least two dilemmas thus arise: the issue of underage participants and the sensitive subject of NSSI. In ethical research with children, informed consent or parental consent is usually considered a central aspect, as is the protection of underage research participants (Morrow & Richards, 1996).

According to the Swedish Ethical Review Act, section 18, active consent from the parent is not mandatory when the adolescent is over 15 years of age: "If the subject of the research is over 15 years of age, but has not attained the age of 18 and realizes what the research entails for his or her part, he or she shall personally be given information about the research and shall consent to the research..." (Svensk författningssamling [SFS], 2003:460). NSSI researchers have a responsibility to ensure that the data collection is handled respectfully with special attention to the welfare of underage participants. One way is to provide crisis line numbers or lists of campus and community resources that offer psychological counseling or therapy and to encourage participants to seek help if needed (e.g., Armeij & Crowther, 2008; Turner et al., 2013). A more active approach was taken by Plener, Libal, Keller, et al. (2009), who during data collection on NSSI in a school setting gave adolescents a chance to fill in a HELP card and put their contact information in a separate envelope if they wanted to be contacted. In their study 0.6% of 670 participants requested help for SIB. Further examples of how the welfare of participants can be ensured is presented in a study by Turner et al. (2013), who ended their data collection of NSSI with a positive mood induction task and the option of playing a soothing online game.

One concern that is often raised regarding screening or administering self-report questionnaires about sensitive questions such as SIB is that the questions themselves can trigger distress or actual SIB in the participants. According to Swannell et al. (2014), some ethics committees do not allow checklist questions of self-injury items for this reason, yet by erring too much in the other direction – that is, by overemphasizing the vulnerabilities of participants – competent individuals could unfairly be excluded from opportunities to participate in research (American Psychiatric Association's Task Force on Research Ethics, 2006). There is a tendency in research on sensitive subjects to base decisions and concerns less on empirical evidence and more on general fears and impressions (Deeley & Love, 2010). It is therefore of considerable interest to review the empirical research in this matter.

One frequently cited study in this field is the work of Gould and colleagues (2005). They conducted a randomized controlled trial of 2,342 adolescents, evaluating possible iatrogenic risk of screening for youth suicide. Neither distress nor suicidality increased among those adolescents who answered screening questions concerning suicidality. On the contrary, high-risk adolescents with depressive symptoms, drug problems and previous suicide attempts seemed less distressed and suicidal than high-risk adolescents in the control group, who were not given questions on this topic. One interpretation, contrary to traditional belief, is that the act of answering this kind of question can actually be beneficial. Other studies have also found support for only minimal negative mood induction in adults (Crawford et al., 2011) and adolescents (Deeley & Love, 2010) when administering questions of a sensitive nature. In one study, adolescents and their parents were asked whether they considered screening for drug use and suicidality could encourage such behaviors, and the answer was negative from both adolescents and parents (Fisher, 2003). Even in a high-risk group of adolescents, repeated testing for suicidal ideation was not associated with subsequent increases (Mathias et al., 2012). Another study also showed that even a high-risk group of adults with BPD and suicidality could participate in research on suicidality (Reynolds, Lindenboim, Comtois, Murray, & Linehan, 2006). Iatrogenic effects on other sensitive subjects,

such as sexual abuse, have also been investigated. A majority of adolescents who participated in a data collection on sexual abuse reported that they did not experience distress after the investigation, and the same applied to vulnerable adolescents who had experience of sexual abuse (Priebe, Bäckström, & Ainsaar, 2010). This is, however, inconsistent with results from a study on adolescents by Langhinrichsen-Rohlin, Arata, O'Brien, Bowers, and Klibert (2006), who found that a small percentage reported feeling upset while completing the sensitive questions, and this was particularly endorsed by those who had experienced suicidality, drugs, or physical or sexual victimization. The authors, however, concluded that such experiences only explained 6.6% of the variance in adolescents' upset ratings.

Less empirical work has been done on iatrogenic effects of NSSI research specifically. When Muehlenkamp, Walsh, et al. (2010) conducted a study in schools examining the effects of a prevention intervention, they also assessed iatrogenic effects. Their findings showed that asking adolescents in schools about NSSI did not increase frequency or intensity of NSSI between the pre-test and post-test. Similarly, a follow-up interview with adolescents with NSSI after they had filled in an NSSI questionnaire found that adolescents generally reported positive feelings about being interviewed. When NSSI was reported in a questionnaire one year after the interview, there were no indications of iatrogenic effects from participating in the interview (Bjärehed, Pettersson, Wångby-Lundh, & Lundh, 2013). One important empirical contribution is the recent experimental study by Muehlenkamp, Swenson, Batejan, and Jarvi (2014), where no support for short-term iatrogenic effects were found in college participants in those randomized to answer NSSI questions ($n = 439$) compared to the control group ($n = 408$).

Thus, based on empirical research there seems to be accumulating evidence that asking research questions about suicidality and NSSI does not generally trigger such behaviors or generate significant discomfort in participants (e.g., Bjärehed et al., 2013; Deeley & Love, 2010; Friedman, 2006; Gould et al., 2005; Muehlenkamp, Walsh, et al., 2010; Muehlenkamp et al., 2014).

The Empirical Studies

Overall Aims

The overarching aims of the present thesis were to investigate the prevalence, methods, characteristics and functions of NSSI in a large community sample of Swedish adolescents, and to examine the relationship between NSSI and adverse life events and trauma symptoms.

Aims and Hypotheses

Study I

The aims of the first study were threefold. The first aim was to assess prevalence and characteristics of NSSI. The second aim was to use the suggested diagnostic criteria in DSM-5 to describe preliminary prevalence rates and demographics of a potential NSSI disorder. The third aim was to extend previous knowledge on the self-reported functions of NSSI in adolescents and to examine whether Nock and Prinstein's (2004) FFM could be confirmed in a large Swedish community sample.

Study II

This study elaborates further on the research examining differences between groups of SIB with and without suicide intent. The main aims were thus to examine whether adolescents with no SIB, NSSI (1–4 times, 5–10 times, ≥ 11 times), SA and NSSI+SA differ, firstly with regard to self-injurious thoughts, secondly with regard to demographic variables and thirdly with regard to self-reported experience of several different adverse life events and trauma symptoms, such as depression, anxiety, anger, posttraumatic stress and dissociation. Based on previous research and a cumulative perspective on adversities, it was hypothesized that the groups would differ, with the no-SIB group reporting less self-injurious thoughts, socioeconomic disadvantage and fewer adverse life events and symptoms than the NSSI groups, and that the NSSI groups in their turn would report less than the NSSI+SA group, who would be the most disadvantaged. It was also hypothesized that adolescents with more frequent NSSI would be more disadvantaged than those with less frequent NSSI.

Study III

Since results in study I showed that there was room for improvement of the factor structure in this sample, study III aimed at examining further the underlying factor structure of the functions of NSSI in FASM, using Mplus and the robust mean and variance adjusted weighted least squares (WLSMV) estimator which is suitable for ordinal data. Apart from this project, FASM has not previously been psychometrically tested in a Scandinavian context. This motivated an empirically driven generation of underlying factors (EFA), followed by a confirmation of the generated factors (CFA), on different subsets of the sample for cross-validation purposes. As a follow-up, and given our aspiration to adhere to learning theory and positive and negative reinforcement, theory-driven models were also examined (using CFAs) on both the derivation and the validation sample.

Study IV

This study aimed to examine the mechanisms that are associated with engaging in NSSI for either social or automatic purposes, by exploring the specific relationship between several self-reported adverse experiences during childhood, individual trauma symptoms and the functions of NSSI.

We predicted that there would be specific relationships between adverse life events and symptoms of traumatic stress and the automatic and social functions, respectively, and that the relationship between adverse life events and specific functions of NSSI would be mediated by trauma symptoms. More specifically, we predicted that maltreatment, such as emotional, physical and sexual abuse, would be significant predictors for automatic functions. A suicide attempt would also be associated with automatic functions. We proposed that trauma symptoms, specifically symptoms of depression, dissociation and posttraumatic stress, would predict automatic functions of NSSI in the multivariate model and also mediate the relationship between childhood maltreatment and the automatic/intrapersonal functions of NSSI. Relatively less research has been carried out on the correlates of social functions. We predicted that experiences of bullying would be associated with social functions, but apart from this we chose not to specify the relationship exactly and thus analyses of the social functions were explorative.

Method

All empirical studies had a cross-sectional design and were based on the same study population: adolescents in the county of Östergötland, aged 15-17 years, in their first year of high school.

Participants

A conditioned randomized sampling process was used in order to ameliorate the possibility of selecting students from large and small municipalities, urban and rural areas and larger and smaller schools as well as state and private schools. Students from both vocational and theoretical education programs were included in the sample to provide diversity in socioeconomic status and gender. In order to achieve a sample size of 3,000, 70% of the approximately 6,000 students in their first year of high school in Östergötland in each of the 17 national education programs (Skolverket, 2010) and the so-called individual program (for adolescents who lack formal competence to begin high school) were selected through a randomization process of school classes (expecting a drop-out rate of approximately 20%). The county of Östergötland was chosen for reasons of convenience. Randomization was performed using random.org (Haahr, 2010). When a selected school class or school declined to participate in the study, the next school class in the order given by randomization was contacted until a sufficient sample size had been reached.

Special classes for students with pervasive developmental disorders, such as autism and mental retardation, were excluded from the study, as were classes of adolescents who had recently come to Sweden as refugees or immigrants. The former were excluded to ensure that the behavior was not part of a pattern of repetitive stereotypes, or could not be better explained by another mental disorder, such as autism spectrum disorder or intellectual disability, in accordance with the proposed NSSI criteria (APA, 2013). The latter group was excluded due to expected language barriers, preventing them from successfully filling out the questionnaire. In the spring of 2011 there was a total of 48 high schools in eleven of Östergötland's 13 municipalities. Thirty-six schools from eight municipalities were included in the study. Four schools declined to participate due to concern that the subject of self-injury might have a negative influence on the adolescents. Another four schools reported lack of time and resources as reasons not to participate. One school did not reply, two were not selected in the randomization process and one school only had four pupils in their first year. There was a total of 294 school classes in the 17 education programs and the individual program. Two hundred and six classes were chosen by randomization, resulting in 3,960 students. The sample in study I with 3,060 adolescents (with corresponding national data for 16-year olds from Statistics Sweden [Statistiska centralbyrån, 2011] and The National Agency for Education [Skolverket, 2010] presented in brackets) consisted of 49.5% [51.2%] boys and 50.5% [48.8%] girls. The percentage of adolescents born outside Sweden was 8.5% [8.8%] and

61.1% [59.2%] lived with both parents. Of the 17 national education programs, 53.4% [52.2%] of adolescents participated in theoretical programs and 46.6% [47.8%] in vocational programs. Of the total sample, 84.5% [84%] reported that their mothers were working and 86.1% [92%] said that their fathers were working.

Figure 3. Flowchart of participants included in the four empirical studies. FASM = Functional Assessment of Self-Mutilation, LYLES = Linköping Youth Life Experience Scale, NSSI = non-suicidal self-injury, TSCC = Trauma Symptom Checklist for Children, SIB = self-injurious behavior.

Procedure

The headmaster/headmistress of each school with school classes that had been selected to participate through randomization was contacted and given information about the study and they then gave their consent for the school to participate. One week prior to our visit in the classroom, teachers distributed written information about the study. Students and parents were informed that participation was voluntary, and if the students wished to participate in the study they should show up in class the following week when the data collection would take place. Absence would not result in a comment from teachers. According to the Ethical Review Act of Sweden (SFS, 2003:460), active consent is not required from parents when adolescents are 15 years of age or older. Parents were informed that they were welcome to contact the research group if they had any questions. Six parents contacted the author (MZ) by telephone, wanting more information about the study. Before filling out the questionnaires, students were again informed about the aim of the study and that participation was voluntary. Those students who thereafter gave their informed consent, by actively choosing to fill in the questionnaires, participated in the study. Written informed consent from students was not used since the study was anonymous. Data collection was performed in the classroom, with desks placed sufficiently far apart to ensure anonymity. Teachers were asked to leave the classroom. The questionnaires consisted of twelve pages and took approximately 25–30 minutes to complete. The questions on the first two pages were demographic in character, followed by five pages of questions on self-injury. The last five pages consisted of questions on potentially traumatic life events and trauma symptoms.

Ethical issues

During the data collection students were encouraged to seek professional help if needed. Additionally, every student was given written information to take home listing contact information to several counseling alternatives. Students were also informed that they could contact the author (MZ) personally (a clinical psychologist). When we spent several hours at a school collecting data, students were encouraged to contact us directly if they needed help. Five students did so, but none of them presented a query concerning own self-injury. Furthermore, to avoid attention being drawn to participants with NSSI who would need more time to fill out the questionnaires, three pages of neutral questions concerning leisure activities and television habits were added at the end. Participants who quickly finished the questions on self-injury continued with these questions. When all participants had reached the last section of pages the questionnaires were collected. The study was approved by the Regional Ethical Review Board of Linköping (Dnr, 2010/195-31).

Measures

FASM (study I, II, III and IV)

The Functional Assessment of Self-Mutilation (FASM; Lloyd et al., 1997) assesses the methods, frequency and functions of self-reported deliberate NSSI. Respondents are asked whether they have engaged in any of eleven different forms of NSSI during the past year. The frequency of the NSSI and whether medical treatment was received is also assessed. Participants are also asked the length of time they had contemplated the behavior(s), at what age their NSSI first began, whether any of the NSSI was performed under the influence of drugs or alcohol, the degree of physical pain experienced during NSSI and whether any of these behaviors was a suicide attempt. FASM consists of 22 statements assessing the functions of NSSI, which respondents rate on a four-point Likert scale, ranging from “never” to “often”. Different examples of functions were derived from theories of NSSI, such as affect regulation, interpersonal influences, dissociation and self-punishment (Lloyd-Richardson et al., 2007). FASM has been used in normative (Leong et al., 2014; Lloyd et al., 1997; Young et al., 2014) and psychiatric samples (Guertin, Lloyd-Richardson, Spirito, Donaldson, & Boergers, 2001; Kaess et al., 2013). FASM has showed acceptable psychometric properties in adolescent samples (Guertin et al., 2001; Penn et al., 2003), with adequate internal consistency for both minor and moderate/severe forms of NSSI ($\alpha = .65 - .66$). There is also support for the concurrent validity of FASM demonstrating significant associations with measures of a recent suicide attempt, hopelessness and depressive symptoms (Nock & Prinstein, 2005). A CFA (Nock & Prinstein, 2004) placed 21 of the items assessing functions into one of four subscales: ANR (2 items: $\alpha = .62$), APR (3 items: $\alpha = .69$), SNR (4 items: $\alpha = .76$) and SPR (12 items: $\alpha = .85$).

FASM was translated into Swedish using a back translation procedure. The reliability and validity of the Swedish version of FASM was tested in a pilot study with a community sample consisting of 84 adolescents aged 15–17 years. A three-week test-retest procedure was administered and was completed by 71 adolescents. In this thesis Cronbach’s alpha for all NSSI items was $\alpha = .84$ (study I and II) and $\alpha = .80$ (study III and IV). Results for the subscales referred to in Lloyd et al. (1997) as minor and moderate/severe forms of NSSI was $\alpha = .74 - .77$ (study I), $\alpha = .74 - .76$ (study II) and $\alpha = .64 - .70$ (study III and IV). Cronbach’s alpha for all FASM functions was $\alpha = .88$ (study I and III) and for both the automatic/intrapersonal and social/interpersonal factors: $\alpha = .86$ (study IV).

SITBI-SF-SR (Study I and II)

The Self-Injurious Thoughts and Behaviors Interview-Short Form-Self-Report (SITBI-SF-SR) was developed from SITBI (Nock et al., 2007), a structured interview that assesses a wide range of self-injurious thoughts and behaviors. SITBI’s psychometric properties have been evaluated,

suggesting strong interrater reliability (average $\kappa = .99$, $r = 1.0$) and test-retest reliability (average $\kappa = .70$, intraclass correlation coefficient $t = .44$) over a six-month period. Concurrent validity has been demonstrated with strong correspondence between SITBI and other measures of suicidal ideation (average $\kappa = .54$), suicide attempt (average $\kappa = .65$), and NSSI (average $\kappa = .87$). The self-report version used in this study assesses presence, frequency and characteristics of suicidal ideation, suicide plans, suicide gestures, suicide attempts and NSSI. Each area begins with a general screening question: “Have you ever had thoughts of non-suicidal self-injury (NSSI; that is, thoughts of purposely hurting yourself without wanting to die, for example thoughts of cutting or burning)?” with follow-up questions concerning age of debut, frequency and intensity during lifetime, last year, last month and last week. Questions from the self-report version have previously been used on adolescents in a study by Muehlenkamp, Walsh, et al. (2010). Only the questions on lifetime prevalence, age of debut and annual prevalence from SITBI-SF-SR were used in the present thesis. Results from the pilot study showed good test-retest reliability.

LYLES (Study II and IV)

Linköping Youth Life Experience Scale (LYLES) is an instrument for gauging potentially traumatic life events, including adverse childhood circumstances. It has been developed from Life Incidence of Traumatic Experiences (Greenwald & Rubin, 1999). LYLES contains 23 main questions with more detailed secondary items; 18 items are considered non-interpersonal (such as being in a car accident), 13 items interpersonal (such as having been exposed to physical or sexual abuse), and 10 items ask questions about more longstanding adverse childhood circumstances (such as alcohol abuse in family). LYLES is intended to cover several important types of potentially traumatic events and circumstances during an adolescent’s lifespan. There are subquestions on several items to cover the respondent’s proximity to the event, i.e., whether the person has experienced the event himself/herself or witnessed it. The scores for the different non-interpersonal and interpersonal events are added and the sum represents the content of the total scale Sum of events or polytraumatization. The total number of times an adverse circumstance has occurred provides the sum used in the scale Sum of times. LYLES has been evaluated on Swedish adolescents from the normative population. Its psychometric properties have been shown to be satisfactory with test–retest $r = .79$ and kappa item per item ranging between $k = .44$ and 1.0 (Nilsson, Gustafsson, Larsson, & Svedin, 2010). In study IV only the items assessing direct experience of maltreatment and adversities from the interpersonal and adverse circumstances subscales were used (response yes/no). A combination variable, “parental chronic adversity” was created post hoc by adding items “separated from parents”, “parental divorce”, “parental quarreling after divorce”, “parental drug or alcohol problem”, “parental mental health problems”, “prolonged illness or handicap”, and “parent in jail”.

TSCC (Study II and IV)

The Trauma Symptom Checklist for Children (TSCC; Briere, 1996) is a self-report questionnaire developed to identify symptoms of traumatic stress in children and adolescents aged 8–17 years. The questionnaire consists of 54 items and the respondents rate their answers on a four-point Likert scale from 0 (never) to 3 (almost always). The results are divided into six subscales: anxiety, depression, anger, posttraumatic stress, sexual preoccupation and dissociation, with 9–10 items in each. TSCC has been translated into Swedish and evaluated on Swedish children and adolescents (Nilsson, Wadsby, & Svedin, 2008). Good reliability such as internal consistency (Cronbach’s alpha) for the total scale .94 (ranging in the clinical scales .78 – .83) and test–retest for the total scale $r = .81$ (ranging in the clinical scales $r = .67 - .81$) has been found. The confirmatory 6-factor analysis explained 50.7% of the variance. Other validity measures, such as concurrent validity and criterion-related validity, were also shown to be satisfactory. The normative sample of Swedish children and adolescents showed lower means on the subscales than has been reported in previous studies from a number of other countries. The Swedish version of TSCC has been shown to be a screening instrument with satisfactory psychometric properties

that is capable of identifying trauma symptoms among children and adolescents (Nilsson et al., 2008). The subscale sexual concern was not used in this study. Internal consistency was good for the subscales used in the sample for study II and IV, respectively: $\alpha = .88$; .90 (depression), $\alpha = .83$; .84 (anxiety), $\alpha = .86$; .85 (anger), $\alpha = .89$; .90 (posttraumatic stress) and $\alpha = .86$; .87 (dissociation).

Demographic questionnaire (Study I, II, III and IV)

A demographic questionnaire was created for the purpose of the study assessing demographic characteristics and health-related behaviors with questions such as “Do you smoke?”, “How often do you drink alcohol?” and “Have you ever used drugs?” Frequency and amount were measured with fixed answer categories ranging from never to four times per week for alcohol and drugs and from never to daily for smoking.

Data Analysis

Study I

Categorical data were analyzed with descriptive statistics using frequencies and cross-tabulation with chi-square (χ^2) and crude odds ratio (cOR). For reliability with test-retest procedures, Spearman’s rank correlation coefficient (r_s) and Phi coefficient (r_ϕ) were used on ordinal and nominal data respectively. To assess concurrent validity, Phi coefficient (r_ϕ) was used. Internal consistency was assessed using Cronbach’s alpha (α). A CFA was performed using AMOS 20.0 (SPSS Inc, Chicago, IL). Model fit between the (non-nested) two- factor and four-factor models was made by comparing Akaike information criterion (AIC) and Bayes information criterion (BIC), where lower indices indicate preferred models. All other statistical analyses were performed using SPSS version 20.0.

Study II

Categorical data were analyzed with descriptive statistics using frequencies and cross-tabulation with χ^2 . Phi coefficient and Cramers’s V were calculated for effect size (ES). Internal consistency was assessed using Cronbach’s alpha (α). Separate One-way Analysis of Covariance (ANCOVA) was used for analyses of group differences using self-injurious status as independent variable and subscales non-interpersonal events, interpersonal events and adverse childhood circumstances from LYLES and subscales depression, anxiety, anger, posttraumatic stress and dissociation from TSCC as dependent variables. Gender, parental occupation status and living conditions were covariates. ES was calculated for group comparison using partial eta squared (η^2). Post hoc pairwise analyses were performed using Bonferroni adjustment for multiple comparisons. All statistical analyses were performed using the SPSS 19.0 software package.

Study III

The derivation cohort (60% of the study sample, $n = 502$) was used to generate a factor model using EFA, and the validation cohort (40% of the study sample, $n = 334$) was used to confirm the model using CFA. Firstly, an EFA was performed to generate a data-driven model, which was then validated with a CFA. Secondly, two separate CFAs were performed on the theory-driven models, using both the derivation cohort and the validation cohort to cross-validate results. EFA as well as CFA were carried out with Mplus, Version 7 (Muthén & Muthén, 1998-2012), using the WLSMV estimator method based on polychoric correlations and the diagonal of the weight matrix. In the EFA, oblique rotation was used to allow for correlation between the factors. The decision regarding the number of factors to retain was based on Kaiser Criteria (eigenvalue > 1.0) and inspection of scree plot, in the absence of parallel analysis on (ordered) categorical data in Mplus. Overall model fit was tested by χ^2 statistics and fit indices provided by the Mplus output:

Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI, also known as the Non-normed fit index [NNFI]) and Standardized Root Mean Square Residual (SRMR). In the CFA, the Weighted Root Mean Square Residual (WRMR) was also used instead of SRMR. Discriminant validity was tested using the procedure suggested by Fornell and Larcker (1981), i.e. that the average extracted variance for each factor should be at least .50 and exceed the squared correlations with the other factors. Cronbach's alpha was used to test the internal consistency of the different factors. Categorical data were analyzed with descriptive statistics using frequencies and cross-tabulation with χ^2 statistics, performed in IBM SPSS Statistics (version 20.0).

Study IV

Categorical data were analyzed with descriptive statistics using frequencies and cross-tabulation with χ^2 . Phi coefficient was calculated for ES. Multiple hierarchical linear regression analysis was used, controlling for NSSI frequency and gender. The dependent variables were the social and automatic functions of NSSI, respectively. The predictors/explaining variables entered into the model were different self-reported maltreatment/adverse childhood experiences and trauma symptoms (depression, posttraumatic stress, anxiety, anger, dissociation), as well as having made a suicide attempt. There was violation of the assumption of homoscedasticity for the social functions and the standard errors were therefore adjusted using the heteroscedasticity-consistent standard error estimator (Hayes & Cai, 2007). Mediation was tested using the bootstrapping method with bias-corrected confidence estimates (MacKinnon, Lockwood & Williams, 2004) and the 95% CI of the indirect effects was obtained with 5000 bootstrapping resamples (Preacher & Hayes, 2008). All statistical analyses were performed using the SPSS 20.0 software package with macros (HCREG and INDIRECT) downloaded from <http://www.afhayes.com/spss-sas-and-mplus-macros-and-code.html>.

Results and Discussion

Study I

Prevalence and methods of NSSI

When asked a single general NSSI question from SITBI-SF-SR, 525 (17.2%) adolescents replied in the affirmative, while 1,088 (35.6%) adolescents reported having engaged in NSSI at least once during the past year using FASM checklist, including both minor and severe NSSI. Reported mean debut age for NSSI was 13.9 years ($SD = 1.7$). The most commonly reported type of NSSI in this sample was "bit yourself", followed by "hit yourself on purpose", "'erased' your skin" and "cut or carved on your skin". The prevalence rate from checklist in this study is very similar to previous results from school-based samples of adolescents in Sweden, ranging between 34-42% (Jutengren et al., 2011; Lundh, Wångby-Lundh, & Bjärehed, 2011), as well as single item assessment of 17% (Landstedt & Gillander Gådin, 2011) and falls within the upper range compared to other international studies (e.g., Cerutti et al., 2011; Plener, Libal, Keller, et al., 2009; Lloyd-Richardson et al., 2007; Muehlenkamp et al., 2012).

DSM-5 NSSI criteria

Using the criteria for the suggested DSM-5 diagnosis from the earlier APA (2012) version, 205 adolescents (6.7%) fulfilled criteria for a NSSI disorder (171 girls and 34 boys). Of these, 41 adolescents reported that at least one of their self-injuries during the last year was a suicide attempt. With regard to criteria A, a majority of adolescents (73.7%) in the DSM-5 NSSI group had performed NSSI ≥ 11 times during the last year. Almost all of the adolescents (99.5%) reported having engaged in NSSI with the expectation of a contingent response (relieve interpersonal difficulty, or negative feeling or cognitive state, or induce a positive feeling) and

that negative feelings or thoughts occurred (psychological precipitant) prior to NSSI (98.5%), making these items the two most commonly reported in criterion B (i.e. criteria B and C in the present DSM-5 version). In relation to criterion C (the equivalent of DSM-5 criterion E), 23.2% in the NSSI group did not acknowledge distress, whereas only 7.8% did not acknowledge impairment. Compared to those with NSSI not meeting criteria for NSSI diagnosis, those who met criteria consisted of significantly more girls and appeared to be a more burdened group with more risky health-related behaviors, such as smoking, alcohol consumption and drug use. The DSM-5 NSSI group also reported more pain when performing NSSI and had thought about NSSI for a longer time period prior to engaging in it, compared to the NSSI group that did not meet criteria for diagnosis, who perceived their NSSI to be more impulsive. However, this may simply be due to the fact that a period of preoccupation with the intended behavior, before engaging in NSSI, is one of the criteria for a diagnosis (APA, 2012).

Interestingly, there seems to be consensus with regard to diagnostic criterion B in the empirical studies on DSM-5 NSSI criteria. Glenn & Klonsky (2013) used a very similar approach to our study in their clinical sample of adolescents and assessed criterion B (i.e. criteria B and C in the present DSM-5 version) with functions from ISAS. In their study almost all self-injurers (98%) reported that NSSI served an affect regulation function and that NSSI was preceded by negative feelings. A high number (97.4%) reported a psychological precipitant of negative thoughts or feelings in In-Albon et al.'s (2013) study, which is almost identical to the 98.5% in our study, measured with FASM. Similarly, the contingent response was endorsed by many adolescents, both in our study and in other empirical work (Glenn & Klonsky, 2013; In-Albon et al., 2013). Lengel and Mullins-Sweatt (2013) also found that the features described in criterion B were assessed by clinicians as prototypic and relevant symptoms of the NSSI diagnosis (Lengel & Mullins-Sweatt, 2013).

Similarly, there seems to be consensus regarding criterion C (i.e. criterion E in the present DSM-5 version), but for a different reason. In another Swedish study by Odelius and Ramklint (2014a), where suggested DSM-5 criteria were assessed by interviewing 39 young self-harming psychiatric outpatients aged 13-25 years, criterion C was the criterion that their self-harming patients more often failed to fulfill. Of those who did not receive a diagnosis of NSSI, 43% failed because they did not fulfill the C criterion. The interviewers thought the criterion was difficult to assess, since patients reported that their self-harm was helpful rather than distressing. Similarly, impairment was also difficult to assess since patients claimed that the self-harm did not result in problems for them. Further support for this was found in In-Albon et al. (2013), where a group of adolescents with repetitive NSSI denied being impaired or distressed. In the In-Albon study, 69.2% confirmed distress, compared to our study's result of 76.8%. In order to better operationalize the interference/distress criteria, In-Albon et al. (2013) added the question whether adolescents desired help for their NSSI, which in its turn received a 79% endorsement. The distress issue in NSSI has previously been problematized by Wilkinson and Goodyer (2011): "...in some cases, the intense distress may immediately precede, and trigger, the self-injury, and are not caused by it" (p. 107). Perhaps NSSI differs from other diagnoses in children and adolescents, such as depression, social phobia or ADHD, where the issue of distress and impairment is more readily applicable. NSSI is more likely to be regarded as a solution, reducing distress, at least temporarily. This is confirmed by the fact that affect regulation functions were most often endorsed by adolescents in this study. Clinicians also rated this proposed criterion as less prototypic, suggesting that while clinicians were concerned with NSSI and its consequences, individuals with NSSI may not always perceive themselves as impaired in their everyday lives (Lengel & Mullins-Sweatt, 2013).

Some converging results are thus emerging from the few empirical studies on a potential NSSI disorder. It seems possible to assess and implement the suggested criteria for both adolescents

and adults in clinical and community samples. More adolescent girls than boys met criteria both in our community sample and in Glenn and Klonsky's (2013) inpatient adolescent sample. In particular, the psychological precipitant and contingent response criteria seem to be core features, as nearly all adolescents, both in clinical samples (In-Albon et al., 2013; Glenn & Klonsky, 2013) and in our community sample, endorsed these criteria. The interference/distress criterion seems somewhat more problematic, and would perhaps benefit from rephrasing.

The functions of NSSI

The functions most often reported were "to stop bad feelings" (reported by 46.9%), "to relieve feeling 'numb' or empty" (45.6%), "to punish yourself" (40.7%) and "to feel something, even if it was pain" (38.0%). The factors positive and negative automatic reinforcement were reported by 29.3 – 46.9% of adolescents who performed NSSI during the past year, whereas social functions (including the item "to get control of a situation") were reported by 5.6 – 28.9%. All but six of the 22 functions were significantly ($p < .01$) more often reported by girls (12.4 – 63.1% of girls) than boys (6.4 – 26.7%), with the largest gender difference for automatic functions. That the most frequently reported factors by adolescents were positive and negative automatic reinforcement is in agreement with previous research mainly supporting an affect regulating function of NSSI (Nixon et al., 2002; Nock & Prinstein, 2004; Penn et al., 2003). In our study, the automatic functions were more common among girls, as in Klonsky and Glenn (2009), but others have not found support for this (Lloyd-Richardson et al., 2007). However, the self-punishment function has been consistently more often reported by girls (Laye-Gindhu & Schonert-Reichl, 2005; Lloyd-Richardson et al., 2007). The DSM-5 NSSI group followed the same pattern of functions as adolescents with NSSI who did not meet DSM criteria. However, a higher proportion of adolescents with NSSI disorder endorsed the different functions. Lloyd-Richardson et al. (2007) found more support for social functions in their community sample of adolescents than was found in the present study. However, social functions were also reported, with approximately a fifth of adolescents with NSSI choosing as a reason "to try to get a reaction from someone, even if it's a negative reaction" and "to get attention". In the DSM-5 group as many as 47.9% reported "to try to get a reaction from someone, even if it's a negative reaction" and 44.2% "to get help". Thus, social functions also need to be acknowledged in adolescent samples within the context of adaptive self-help, as suggested by Nock (2008) and Hagen et al. (2008).

Factor analysis of the two-factor and four-factor model

Nock and Prinstein's (2004) theoretically derived four-factor model resulted in a close to acceptable fit in this sample (χ^2 (159, $N = 836$) = 745.89, $p < .001$, CMIN/df = 4.69, NFI = .89, IFI = .91, CFI = .91, RMSEA = .066 (90% CI [.062, .071])). With the aim of validating the four-factor model, correlations of residuals were allowed within factors when recommended by AMOS modification indices [Jöreskog & Sörbom, 1984] and theory. The factors were also allowed to correlate. We also examined the two-factor model (social reinforcement and automatic reinforcement), which was also tested in Nock and Prinstein's (2004) study. The two-factor model showed a slightly better fit (χ^2 (130, $N = 836$) = 509.74, $p < .001$, CMIN/df = 3.92, NFI = .92, IFI = .94, CFI = .94, RMSEA = .059 (90% CI [.054, .065])) and was preferred over the four-factor model in this sample according to smaller AIC and BIC indices (AIC: 670 vs. 890; BIC: 1048 vs. 1230). However, data did not fit either the two-factor or four-factor model as well as previously shown. There is thus room for improvement regarding the model of functions of NSSI on the present data from a Swedish sample of community adolescents, which is the aim of study III.

Study II

2,964 adolescents were grouped into six categories based on self-reported lifetime prevalence of SIB. Of the total sample, 1,651 (55.7%) adolescents reported no SIB, 630 (21.2%) reported NSSI

1–4 times, 177 (6.0%) reported NSSI 5–10 times, 311 (10.5%) reported NSSI ≥ 11 times, 26 (0.9%) reported lifetime prevalence of suicide attempt and 169 (5.7%) adolescents reported both NSSI and suicide attempt. Of the adolescents ($N = 195$) who reported having made a suicide attempt, 169 (86.7%) also reported lifetime prevalence of NSSI. However, the majority of adolescents (86.9%) who reported lifetime prevalence of NSSI did not report a concurrent suicide attempt. Among those who reported both NSSI and SA, the reported mean age for NSSI debut was 13.4 years (SD 2.2) and 13.8 years (SD 1.9) for suicide attempt. Thirty-six (29.5%) adolescents reported that they had begun engaging in NSSI and made their first suicide attempt at the same age. Twenty-two (18.0%) adolescents reported that they had made their first suicide attempt prior to engaging in NSSI. The majority, sixty-four (52.5%) individuals, reported that they started with NSSI and then made their first suicide attempt at an older age. More than half (56.5%, $N = 310$) of those who reported NSSI ≥ 11 times reported suicide thoughts and 56 (18.1%, $N = 309$) adolescents reported having made a suicide plan. This co-occurrence was also seen in the SA group, in which seven adolescents (28.0%, $N = 25$) reported thoughts of NSSI.

After controlling for gender, parental occupation and living conditions, there were significant differences between groups. The hypotheses of this study were confirmed, and pairwise comparisons showed that adolescents with both NSSI and suicide attempt reported significantly more adverse life events and trauma symptoms than adolescents with only NSSI, regardless of NSSI frequency. Hence, the NSSI+SA group stood out as the most burdened group and can be distinguished from those with NSSI by the number of adversities experienced and self-reported trauma symptoms. The largest differences (effect sizes) were found for interpersonal negative events and for symptoms of depression and posttraumatic stress. There were also significant differences between all the NSSI groups and adolescents without any self-injurious behavior. There were also significant differences between the groups with differing frequencies of NSSI, with the highest frequency NSSI group reporting more non-interpersonal events, interpersonal events, adverse childhood circumstances, symptoms of depression, anxiety, anger, posttraumatic stress and dissociation than adolescents with NSSI 1–4 times. Group differences were larger for trauma symptoms (partial $\eta^2 = .05 - .09$) than adversities (partial $\eta^2 = .03 - .04$).

Rates of 5.7% of adolescents reporting both NSSI+SA and 0.9% reporting suicide attempts in this study were slightly lower but still fairly similar to the results found in Muehlenkamp and Gutierrez's (2007) community sample with a prevalence of 7.0% and 1.9%, respectively. Our results were also similar, though slightly higher than previous prevalence rates of adolescents reporting both NSSI+SA in other community samples, which ranged between 3.4% and 5.0% (Brausch & Gutierrez, 2010; Plener, Libal, Keller, et al., 2009; Taliaferro et al., 2012), as well as the 4.1% in youth presenting at emergency crisis services (Cloutier et al., 2010). In conclusion, our results seem fairly similar to other studies in the Western world that used similar methods.

An overwhelming majority of those who reported a suicide attempt also reported NSSI, indicating a considerable co-occurrence of these behaviors in adolescents who have made a suicide attempt, which is consistent with other community (Plener, Libal, Keller, et al., 2009) and clinical studies (Jacobson et al., 2008). Suicidal thoughts were common in those who performed NSSI in this sample, a result also confirmed in other studies (Hamza et al., 2012). On the other hand, the majority of adolescents in this community sample who reported NSSI did not report a concurrent suicide attempt, lending support to the idea that it is meaningful to differentiate between groups with regard to suicidal intent (e.g., Nock & Kessler, 2006). There were also distinguishable features between groups, with suicidal thoughts and plans reported most frequently in the NSSI+SA group, as shown previously with regard to suicide ideation in Brausch and Gutierrez (2010) and Plener, Libal, Keller, et al., (2009). A majority of adolescents in this study reported having begun with NSSI prior to making their first suicide attempt. Far fewer reported beginning with a suicide attempt and progressing to NSSI. This is in keeping with results

from the longitudinal studies of clinical (Asarnow et al., 2011; Wilkinson et al., 2011) and community samples (Guan et al., 2012) in this research field which have shown NSSI to be a risk factor for suicide attempt, and as such not to be dismissed lightly.

There seem to be both co-occurring and distinguishing features between the different SIB groups. The NSSI and NSSI+SA groups share experiences of more adverse life events and trauma symptoms compared to the adolescents with no SIB. At the same time the number of adverse life events and symptoms is also what differentiates between groups, indicating that it is meaningful to separate self-injurers on the basis of intent to die. It appears that the different SIB groups are distinguishable, and in this study the NSSI and the SA groups fall between those without any self-injurious behavior and those with both NSSI+SA, as in Asarnow et al. (2011) and Muehlenkamp and Gutierrez (2007).

Study III

An EFA found support for a three-factor structure (eigenvalues 10.92, 2.89 and 1.64) with high standardized factor loadings varying between .696 - .947 (factor 1); .712 - .935 (factor 2), .532 - .971 (factor 3) on the derivation cohort. The fit indices for the exploratory model were $\chi^2 = 279.54$ ($df = 168$) $p < .0001$, CFI = .981, TLI = .973, RMSEA = .036 (90% CI = [.029 - .044]) and SRMR = .051. Despite significant χ^2 due to large sample, the other fit indices indicated excellent fit, with CFI and TLI > .95 (Hu & Bentler, 1999), and RMSEA < .05 and SRMR = .05.

The first factor referred to social functions and only included functions that imply that NSSI was performed in order to receive help and to be noticed. The second factor mainly addressed emotion regulation functions and the attempt to decrease or increase affect by engaging in NSSI (automatic functions). The EFA also identified a separate third factor, including functions such as “to be like someone you respect”, “to feel more a part of a group” and seemed to refer to social functions focusing on relationships with peers. In addition to the peer items, the third factor also included other social items that aimed at avoiding demands, such as school or paying the consequences, as well as making others angry. This factor was named “non-conformist peer identification”, suggesting that the behavior is reinforced in the social context of peer affiliation and identification with a life-style that does not conform to common rules and the demands of society in general. Each of the three factors identified in the EFA differentiated between social and automatic functions. The model was passed on for validation on the validation cohort, conducting a CFA, resulting in good fit indices (see Table 3). Factors in the three-factor model showed positive correlations, good discriminant validity and 36-64% shared variance. The automatic factor and social influence factor had high reliability (Cronbach’s $\alpha = .87$ and $.84$, respectively), the non-conformist peer identification factor somewhat lower (Cronbach’s $\alpha = .74$), but still acceptable.

We let the data guide the second model, but split the third factor into two factors (“avoiding demands” and “peer identification”) to adhere to the idea of negative and positive reinforcement. The four-factor model was first tested in a CFA on the derivation cohort ($n = 502$). The adjusted four-factor model showed a good fit ($\chi^2 = 410.62$ ($df = 183$) $p < .0001$, CFI = .961, TLI = .956, RMSEA = .050 (90% CI = [.043 - .056]) and WRMR = 1.114). The four-factor model was then passed on for validation on the validation cohort ($n = 334$). The results showed an excellent model fit (see Table 3). The automatic factor was the same in both model 1 and model 2. The social influence factor was also the same in both models, with the exception of item 21, “to make others angry”. In the four-factor model, the third factor consisted only of peer identification (social positive reinforcement) items. The fourth factor referred to avoiding demands (social negative reinforcement). Factors in the four-factor model showed positive correlations, good discriminant validity and 17-67% shared variance. Both the automatic factor and the social influence factor had high reliability (Cronbach’s $\alpha = .87$ and $.84$, respectively).

Table 3

CFA Fit Indices for the Two-, Three- and Four-Factor Models of NSSI Functions for the Functional Assessment of Self-Mutilation (n = 334)

Statistic	Two-factor model	Three-factor model	Four-factor model
χ^2 model fit	353.26	358.66	272.16
df	188	206	183
p-value	< .0001	< .0001	< .0001
RMSEA (90% CI)	.051 (.043 - .059)	.047 (.039 - .055)	.038 (.028 - .047)
CFI	.962	.966	.979
TLI	.957	.962	.976
WRMR	1.107	1.034	.886

Note. CFA = confirmatory factor analysis; NSSI = non-suicidal self-injury; RMSEA = root mean square error of approximation; CFI = comparative fit indices; TLI = Tucker-Lewis index; WRMR = weighted root mean square residual

The “avoiding demands” factor had Cronbach’s $\alpha = .69$, which is acceptable, whilst peer identification, with only three items, had relatively low reliability (Cronbach’s $\alpha = .56$). Since each of the factors in the analysis differentiated between social/interpersonal and automatic/intrapersonal functions, we also tested a two-factor model, performing separate CFAs on both the derivation and validation cohort. The two-factor model did not meet criteria for an excellent fit in the derivation cohort ($\chi^2 = 581.80$ ($df = 188$) $p < .0001$, CFI = .933, TLI = .925, RMSEA = .065 (90% CI = [.059 - .071]) and WRMR = 1.416), with e.g., RMSEA > .05. The two-factor model, however, showed a good fit in the validation cohort (see Table 3).

Three-factor and four-factor model

Factor 1: social influence.

To some extent this factor is congruent with the social positive reinforcement factor in Nock and Prinstein’s (2004) original FFM. However, the EFA in this study identified a clearer help-seeking factor, consisting only of items where engaging in NSSI is anticipated to influence others so as to increase their support and commitment, which is likely to reinforce the behavior. In our study this factor thus distinguished between social influence items that refer to help-seeking, and peer identification items, which were not included. The first factor in our analysis closely resembles the interpersonal influence factor found in Kaess et al. (2013). This further supports the supposition that NSSI in adolescents is also motivated by social functions (Lloyd-Richardson et al., 2007; Nock & Prinstein, 2005). Although it is perhaps secondary to the emotion regulation functions and not as commonly reported, this social influence factor included functions that were relatively prevalent in this sample.

Table 4

*Standardized Factor Loadings for the Four-Factor Model. CFA in the Derivation Cohort (n = 502),
Followed by a CFA in the Validation Cohort (n = 334)*

		CFA n = 502	CFA n = 334
Social influence			
8	To receive more attention from your parents or friends	.886	.864
7	To try to get a reaction from someone, even if it's a negative reaction	.859	.812
15	To let others know how desperate you were	.859	.674
17	To get your parents to understand or notice you	.835	.820
20	To get help	.829	.856
11	To get other people to act differently or change	.818	.811
21	To make others angry	.772	.785
3	To get attention	.767	.701
Automatic functions			
2	To relieve feeling numb or empty	.920	.854
14	To stop bad feelings	.861	.856
22	To feel relaxed	.804	.819
4	To feel something, even if it was pain	.775	.864
10	To punish yourself	.769	.759
6	To get control of a situation	.747	.733
Peer identification			
19	To give yourself something to do when with others	.989	.729
16	To feel more a part of a group	.745	.828
12	To be like someone you respect	.712	.826
Avoiding demands			
1	To avoid school, work or other activities	.807	.778
5	To avoid having to do something unpleasant you don't want to do	.792	.853
9	To avoid being with people	.782	.838
13	To avoid punishment or paying the consequences	.754	.846
18	To give yourself something to do when alone		

Note. CFA = confirmatory factor analysis.

Factor 2: automatic functions

The automatic factor included the items with functions that were most often reported by adolescents in this study. This is congruent with earlier literature on the functions of NSSI (e.g., Gratz, 2003; Klonsky, 2007, 2009) and converges with evidence that emotion regulation is the main function of NSSI. However, we did not find support for dividing this factor into two factors with positive and negative reinforcement, as in Nock and Prinstein (2004). Instead, the factor consisted of items that aimed at both generating feelings and decreasing arousal, which again is consistent with the results from the factor analysis performed by Kaess et al. (2013) on FASM administered to clinical adolescents in Germany. Nock et al. (2007) have pointed out that some items in the ANR and APR factors are theoretically similar. The fact that the ANR factor in the original FFM (Nock & Prinstein, 2004) only consists of two items could possibly contribute to its difficulty in being replicated in our study, since factors with less than three variables are difficult to interpret (Velicer & Fava, 1998). It could be argued that in theory all items in the automatic factor represent some form of experiential avoidance as a general functional class of behavior, regardless of whether it be the removal of an aversive, or the presentation of an appetitive, stimulus that reinforces the behavior. The aversive state becomes the stimulus for performing NSSI, which is congruent with the theory of experiential avoidance (Chapman et al., 2006). The

positive reinforcement of feeling relaxed, for example, could be preceded by a sense of discomfort that is reduced by performing NSSI.

The question of negative and positive reinforcement with regard to emotion regulation in NSSI has been explored empirically, with some inconsistent results (Klonsky, 2009; Muehlenkamp et al., 2009). Klonsky and Muehlenkamp (2007) also suggested that the anti-dissociation/ feeling-generating function and affect-regulation function overlap because episodes of dissociation or depersonalization may occur as a result of experienced intense emotions. It is thus likely that NSSI is reinforced both by the reduction of an unwanted state as well as the positive sensation of feeling calmer and more relaxed when the negative aversive stimulus is reduced. Selby et al. (2014) have discussed this issue, reporting that adolescents may semantically interpret relief from unbearable emotions as relaxing, for example. For some individuals, both APR and ANR motivations could be simultaneously involved in maintaining NSSI, and that it is a matter of perspective. This could be one possible explanation as to why the automatic factor loaded on all the intrapersonal items in the present study, regardless of whether NSSI was positively or negatively reinforced. Selby et al. (2014) recommend more precise definitions and understanding of the APR construct in order to understand more fully where the APR and ANR functions overlap or are distinguishable.

The three-factor model

Factor 3: non-conformist peer identification

In addition to the first and second factors above, the EFA also identified a third factor, “non-conformist peer identification”, which was confirmed with a good fit in the CFA. This factor loaded on functions that caused us to view the factor as perhaps representing a somewhat socially deviant lifestyle, where the attention is directed toward affiliation with the peer group. In this factor, NSSI is reinforced in the social context of the peers, perhaps by strengthening a feeling of belonging with the reinforcing properties of being part of a group. As Prinstein et al. (2010) pointed out, for some subgroups of peers, as for example non-conformist peer crowds, NSSI may be associated with high status. Peer identification was also identified as a third factor in Kaess and colleagues’ (2013) three-factor model, but in their study the factor did not load on the other “avoiding” items, as was the case in our study. The results from our three-factor model are however very similar to that of Young et al. (2014).

The four-factor model

Factor 3: peer identification

In addition to the first two factors (the social influence and automatic factor), two additional factors were decided upon and tested in the CFA. This was done with the aim of adhering to Nock and Prinstein’s (2004) original four-factor function model based on learning theory with negative and positive reinforcement, as well as integrating the results from Kaess et al. (2013) regarding the “peer identification” factor. In the four-factor model, the third factor, “peer identification”, consisted only of social positive reinforcement items referring to peer identification, similar to the peer factor identified in Kaess et al. (2013). See Table 4 for the four-factor model and factor loadings. Although empirical evidence has shown peer identification/influence to be salient in adolescent NSSI (Jarvi et al., 2013; Prinstein et al., 2010; You, Lin, Fu, & Leung, 2013) and therefore needs to be taken into account when assessing functions of NSSI, these functions were not commonly reported by adolescents in the current self-report study.

Factor 4: avoiding demands

The fourth factor in our four-factor model refers to avoiding demands and is identical to the social negative reinforcement factor in Nock and Prinstein’s (2004) original FFM. The function

“to avoid school, work or other activities” was relatively commonly reported by adolescents in this sample (17.9%).

The four-factor model in our study seems more logical and closer to learning theory, with social positive and negative reinforcement factors and one automatic factor referring mainly to emotional regulation. As in previous research, our results showed that factors seem to be differentiated by “social/interpersonal” and “automatic/intrapersonal” functions. Our four-factor model was preferred in this community sample of adolescents, due to its better fit and adherence to learning theory, as well as the clinical utility of dividing the social functions into separate meaningful factors, such as a separate peer identification, which is probably especially salient for this age group. According to Bentley et al. (2014), it is easier to see a distinction between negative and positive reinforcement in social functions, where the contingencies are more readily distinguishable. This is confirmed in our study, where the social functions could be separated into negative and positive reinforcement.

Study IV

Of the 816 adolescents with NSSI in this study, 186 (22.8%) adolescents fulfilled all the DSM-5 NSSI criteria. Compared to the 630 adolescents that did not meet DSM criteria, significantly more adolescents ($p < .001$) among those fulfilling NSSI criteria reported having experienced bullying, emotional abuse, physical abuse, sexual abuse as well as parental chronic adversity during their lifetime. The difference for emotional and sexual abuse reached medium ES ($\phi = .31$ and $.33$, respectively), whereas the ES for the other maltreatment and adversity variables was small. Furthermore, adolescents meeting diagnostic NSSI criteria reported significantly higher levels of trauma symptoms ($p < .001$) on the subscales of TSCC. All the included maltreatment and adversity items from LYLES and trauma symptom subscales from TSCC were significantly correlated with the automatic and the social functions in the zero-order correlation analysis.

Automatic functions of NSSI

In the hierarchical multiple regression model of the automatic functions of NSSI, the total variance explained by the model as a whole was 62%, $F(14, 793) = 91.28$, $p < .001$. In the final model, NSSI frequency, gender (female), having made a suicide attempt, being exposed to physical abuse by an adult in the family, emotional abuse, having a long-term handicap or illness during upbringing and symptoms of depression and dissociation were all significant (see Table 5). When frequency of NSSI was not included in the analysis, there was a non-significant trend for sexual abuse in the final model ($p = .067$). NSSI frequency, gender (female), emotional abuse, long-term illness or handicap during upbringing and symptoms of depression uniquely predicted automatic functions in the final regression model, and were not significant predictors of the social functions, after adjusting for heteroscedasticity. This implies that more frequent NSSI is associated with the need to engage in NSSI to regulate emotions, punish oneself or to generate feelings.

Previous studies have also found that females were more likely to engage in NSSI for intrapersonal functions (Klonsky & Glenn, 2009), and perhaps especially to punish oneself (Kumar et al., 2004; Laye-Gindhu & Schonert-Reichl, 2005; Lloyd-Richardson et al., 2007), whilst gender difference with regard to social functions have not been found to the same extent (Klonsky & Glenn, 2009). However, there are inconsistencies, with results from Lloyd-Richardson et al. (2007), for example, not supporting gender difference in functions.

After controlling for frequency of NSSI and gender, emotional abuse was a significant predictor in the automatic model, but not in the social model, indicating that there is a unique relationship between self-reported experiences of emotional abuse and the functions that mainly refer to emotion regulation. Even after the mediating effects of symptoms of depression and dissociation

were controlled for, the relationship was still significant. Previous research has found a relationship between NSSI and emotional abuse (Glassman et al., 2007; Rallis et al., 2012; Zoroglu et al., 2003) and interest has been directed toward the effect of invalidating environments and emotional dysregulation (e.g., Gratz & Roemer, 2008). The results in this study contribute further support for the hypothesis that emotional abuse results in intrapersonal vulnerabilities with difficulties in regulating emotions (Nock, 2010), where one strategy to regulate emotions could be to engage in NSSI. This study also corroborates previous findings that symptoms of depression are involved in the emotion-regulating functions of NSSI (Hilt, Cha, et al., 2008; Klonsky & Glenn, 2009; Kumar et al., 2004; Nock & Prinstein, 2005).

Results of the mediation analyses confirmed the mediating role of trauma symptoms (depression and dissociation) in the relationship between self-reported experiences of emotional abuse ($B = 3.24$, $CI = 2.79-3.73$), physical abuse ($B = 2.58$, $CI = 1.99-3.18$), as well as sexual abuse ($B = 3.28$, $CI = 2.60-4.04$) and the automatic functions of NSSI in all three models. The results indicated that the direct effect of emotional abuse ($B = .79$, $t(813) = 3.05$, $p = .002$), physical abuse ($B = .90$, $t(813) = 3.05$, $p = .002$), and sexual abuse ($B = 1.44$, $t(813) = 4.22$, $p < .001$) on the automatic functions of NSSI, when controlling for symptoms of depression and dissociation, was still significant.

Social functions of NSSI

In the hierarchical multiple regression model of the social functions of NSSI, the total variance explained by the model as a whole was 28%, $F(14, 793) = 21.65$, $p < .001$. After adjusting the standard errors using the heteroscedasticity-consistent standard error estimator in the final model of social functions ($R^2 = .28$, $F(14, 793) = 14.37$, $p < .001$), having made a suicide attempt, being exposed to physical abuse by an adult in family and symptoms of anxiety and dissociation were all significant (see Table 5). Symptoms of anxiety uniquely predicted social but not automatic functions. Klonsky and Glenn (2009) also found that anxiety was associated with the social functions of NSSI. Perhaps anxiety represents an affective state, which is “characterized by more elevated arousal or heightened approach motivation” (Bentley et al., 2014, p. 4), compared to depression, for example, which could explain the relationship between anxiety and engaging in NSSI to communicate with and try to influence others.

Results of the mediation analyses confirmed the mediating role of symptoms of anxiety and dissociation in the relationship between self-reported experiences of physical abuse ($B = 1.38$, $CI = .98-1.84$) and the social functions of NSSI. The results indicated that the direct effect of physical abuse ($B = 1.76$, $t(813) = 4.73$, $p < .001$) on the social functions of NSSI, when controlling for symptoms of anxiety and dissociation, was still significant.

Automatic and social functions of NSSI

Physical abuse was a significant predictor in both models. Despite some inconsistencies, several studies have previously found support for a relationship between physical abuse and NSSI, which lends support to its detrimental effect (Martin et al., 2011; Muehlenkamp, Kerr, et al., 2010; Swannell et al., 2012; van der Kolk et al., 1991; Wachter et al., 2009; Yates et al., 2008; Zoroglu et al., 2003). Muehlenkamp, Kerr, et al. (2010) showed that those with self-injury who had also experienced physical abuse had more self-reported difficulties in identifying, recognizing, and being aware of emotional experiences. Yates (2004) has argued that experience of physical abuse can lead to detachment from the body and a probable desensitization to physical pain, which might be one explanation why individuals with such experiences turn to NSSI rather than to less painful experiences (Muehlenkamp, Kerr, et al., 2010).

Table 5

Hierarchical Multiple Regression for the Automatic and Social Functions of NSSI

Automatic functions							Social functions					
Block of predictors	R^2	B	$SE\ B$	β	t	p	R^2	B	$SE\ (HC)^\dagger$	β	$t^\dagger$	$p^\dagger$
	<i>change</i>						<i>change</i>					
1. Frequency of NSSI	.24***	.05	.01	.18	6.79	<.001	.09***	.02	.01	.07	1.42	.155
2. Gender (female)	.12***	.95	.27	.10	3.53	<.001	.03***	-.21	.42	-.02	-.50	.617
3. Self-reported exposure to adversities	.13***						.10***					
Bullied		-.36	.26	-.04	-1.42	.157		.25	.35	.03	.70	.483
Having made a suicide attempt		1.78	.34	.14	5.29	<.001		1.57	.63	.12	2.51	.012
Physical abuse by adult in family		.57	.29	.05	1.99	.047		1.42	.53	.12	2.68	.008
Sexual abuse by adult in family or other		.39	.34	.03	1.14	.254		.77	.56	.06	1.37	.170
Emotional abuse		.61	.26	.06	2.31	.021		.12	.37	.01	.31	.755
Parental chronic adversity		.15	.23	.02	.65	.518		-.21	.31	-.02	-.67	.505
Prolonged illness or handicap during upbringing		.75	.32	.05	2.34	.020		.79	.51	.06	1.55	.121
4. Self-reported symptoms of traumatic stress	.13***						.06***					
Depression		.34	.04	.40	9.37	<.001		.03	.06	.03	.49	.622
Anxiety		.004	.04	.004	.09	.927		.17	.07	.16	2.45	.014
Anger		-.04	.03	-.04	-1.35	.178		.03	.04	.04	.79	.427
Posttraumatic stress		.02	.03	.03	.66	.512		-.001	.04	-.002	-.03	.975
Dissociation		.11	.03	.14	3.61	<.001		.12	.05	.15	2.48	.013

Note. NSSI = non-suicidal self-injury, boldface values represent unique relationship between predictor and automatic or social functions, all statistics (except R^2 change) presented in the table refer to the final fourth model, $\dagger$ values adjusted using the heteroscedasticity-consistent standard error (HCSE) estimator (Hayes & Cai, 2007), $n = 808$ in the model of social functions, due to listwise deletion of missing data being the default option in the HCSE macro, *** $p < .001$.

Symptoms of dissociation were a significant predictor in both the automatic/intrapersonal and the social/interpersonal model. Dissociation was also a significant mediator between different abuse types (emotional, physical, sexual) and automatic functions, as well as mediating the relationship between physical abuse and social functions. The role of dissociation in NSSI has previously been discussed with regard to the mechanism of why individuals engage in NSSI (e.g., Zlotnick et al., 1996; Zoroglu et al., 2003). Gratz et al. (2002) found dissociation to predict self-harm in their multiple regression model for both men and women.

Furthermore, a suicide attempt was a significant predictor in both the automatic and social models; to engage in NSSI in order to escape unbearable emotional experiences and also to communicate with others. That suicide attempts also predicted social functions was contrary to our hypothesis, inconsistent with results by Nock and Prinstein (2005) but in line with the study from Klonsky and Glenn (2009). Those with both NSSI and suicide attempt have previously been found to be a specially burdened and distressed group, both in clinical and community samples (Andover et al., 2012; Asarnow et al., 2011; Boxer, 2010; Brausch & Gutierrez, 2010; Cloutier et al., 2010; Dougherty et al., 2009; Jacobson et al., 2008; Muehlenkamp & Gutierrez, 2007; Muehlenkamp et al., 2011; Taliaferro et al., 2012). These results further underscore the idea that socially reinforced NSSI is not synonymous with the absence of psychopathology (Nock & Prinstein, 2005).

Non-significant predictors

Contrary to our hypothesis, when frequency of NSSI was included in the model and controlled for in the analyses, sexual abuse was not a significant predictor when studied together with other maltreatment variables and trauma symptoms. When frequency of NSSI was not included in the model, there was a non-significant trend for sexual abuse in the model of automatic, but not social functions, indicating that it is possibly more closely related to NSSI functions of emotion regulation, feeling-generation and self-punishment. Further analyses showed that frequency of NSSI mediated the relationship between sexual abuse and automatic functions. Kumar et al. (2004) have previously found support for a relationship between sexual abuse and a punitive function of NSSI, and in a study by Kaess et al. (2013) there was a unique relationship between sexual abuse and automatic, but not social functions.

The variable referring to parental chronic adversities was not significant in either model, potentially suggesting that directly experienced abuse toward the adolescent (e.g., emotional and physical abuse) during upbringing is a stronger predictor of the automatic and social functions of NSSI than more indirect adversities that were measured with the parental chronic adversities variable in this study. Inconsistent with previous results from Hilt, Cha, et al. (2008), and contrary to our hypothesis, peer victimization/bullying was not a significant predictor in the model of social functions, although it has recently been shown to be a factor to take into consideration in the understanding of NSSI (Jutengren et al., 2011). Contrary to our hypothesis, symptoms of posttraumatic stress were not a significant predictor in the model of automatic functions of NSSI. This is inconsistent with previous results, where symptoms of posttraumatic stress were associated with the feeling-generation function (Nock & Prinstein, 2005), and have also been shown to be a mediator between maltreatment and self-injury (Shenk et al., 2010; Weierich & Nock, 2008). In a review of the relationship between PTSD and suicidality, the association weakened when other psychiatric disorders (e.g., depression) were controlled for (Krysinska & Lester, 2010). There is a possibility that such mechanisms are involved in this study when symptoms of posttraumatic stress were included in the multivariate analysis together with other trauma symptoms such as depression and dissociation.

General Discussion

Summary and Strengths

This is the largest study in Sweden to date on NSSI in adolescents, and the results contribute important information about the complex, multi-determined behavior that constitutes NSSI. One of the main strengths of this study is the large randomized sample, consisting of both girls and boys, with a relatively low drop-out rate, increasing representativeness and power for data analysis. Results from this thesis show that NSSI is prevalent in Swedish adolescents; 17.2% answered in the affirmative to a general NSSI question from the SITBI-SF-SR, compared to 35.6% reporting having tried any of several checklist NSSI alternatives listed in FASM at least once in the last year. That different assessment methods result in different prevalence rates is known, with checklists rendering higher prevalence rates compared to general single item questions (Muehlenkamp et al., 2012; Swannell et al., 2014). It has not, however, to my knowledge been shown so clearly in one and the same study. Using different types of SIB questions in the same study is an advantage, since it validates findings and illuminates how different types of questions can influence results. A further strength of the present study is that well-established self-report measures were used. This is especially important in the research field of NSSI, which has been plagued by varying definitions and confusion concerning terminology. In this sample of adolescents, biting, hitting, cutting and erasing skin were commonly reported methods of NSSI.

It was possible to apply the proposed diagnostic criteria of NSSI (APA, 2013), with a preliminary prevalence rate of 6.7% in this community sample. The NSSI disorder group represented a more disadvantaged group compared to those with NSSI who did not fulfill diagnostic criteria. Nearly all the adolescents in the disorder group confirmed that the behavior was performed with the expectancy of contingencies and that their NSSI was precipitated by negative feelings, while relatively fewer adolescents confirmed the distress criterion. This is one of the first empirical studies where the proposed DSM-5 criteria have been applied to adolescents. Empirical data are crucial at this stage, since the criteria are placed in section III of the DSM-5 as a condition needing further study (APA, 2013). The findings can thus contribute important information to the discussion concerning the formulation of a potential NSSI diagnosis.

A prerequisite for the proposed DSM-5 NSSI diagnosis and the term NSSI is that the behavior is not motivated by suicidal intent. Intent is thus an important component which needs to be taken into consideration. Results from this thesis show that it is possible to categorize groups based on suicidal intent (no SIB, NSSI, SA and NSSI+SA), together or separately, and to compare differences in self-reported adversities and trauma symptoms. Furthermore, the large sample made it possible to categorize adolescents with NSSI into several groups based on NSSI frequency, further ameliorating analyses of group differences. There was some overlap between different self-injurious groups, but there were also distinctions. Results showed an almost linear relationship between the number of adversities and trauma symptoms and frequency of SIB. When groups were compared, adolescents with no SIB reported the lowest level of self-injurious thoughts, socioeconomic disadvantage, adversities and trauma symptoms. Adolescents reporting frequent NSSI reported more adversities and trauma symptoms than those with less frequent NSSI. Adolescents with both NSSI and suicide attempts reported the highest levels of adversities and trauma symptoms and appeared to be a particularly burdened and distressed group, who also reported more self-injurious thoughts and socioeconomic disadvantages compared to the groups with only NSSI. Results show that groups of adolescents with SIB, with or without suicide intent, separately or in combination, do in fact differ. This implies that it is meaningful to differentiate between SIB on the basis of suicide intent. These results are an important contribution to recent

years' research concerning distinguishing and overlapping features of suicidal and non-suicidal self-injury, separately or in combination, in adolescents.

Adolescents with frequent NSSI reported more adversities and trauma symptoms, which is consistent with the idea that NSSI may serve to regulate affective and social experiences in adolescents who are especially burdened by adversities and distress. In the sample of self-injuring adolescents used in the fourth study, significantly more adolescents who fulfilled diagnostic criteria for NSSI reported having experienced emotional, physical and sexual abuse and also reported higher levels of trauma symptoms than did adolescents with NSSI who did not fulfill diagnostic criteria. These results can potentially explain why adolescents with NSSI disorder experience negative feelings/thoughts or interpersonal difficulties (DSM-5 criterion C), and thus feel the need to engage in repetitive NSSI (DSM-5 criterion A) in order to relieve negative feelings, cognitive states, interpersonal difficulties or to induce positive feelings (DSM-5 criterion B), as this regulatory function reinforces the behavior.

Results from this thesis showed that automatic/intrapersonal functions, such as affect regulation, self-punishment and feeling-generation, were the most commonly reported functions of NSSI. Social functions were not uncommon in this community sample, although not as commonly reported as automatic functions. Investigations of the functions of NSSI are important, since they have direct implications for functionally specific interventions (Bentley et al., 2014). Attempts to confirm Nock and Prinstein's (2004) FFM resulted in a close to acceptable fit. In order to refine the factor analysis on this community sample of Swedish adolescents, an EFA and CFA was performed in Mplus with the WLSMV estimator, which is suitable for ordinal data, and cross-validation with a derivation and validation sample. The large sample used in the present study thus enables cross-validation, which, to our knowledge, has not previously been done on factors of NSSI functions. The EFA resulted in a three-factor model (social influence, automatic functions and non-conformist peer identification). In an attempt to adhere more closely to learning theory and the concept of negative and positive reinforcement, the third factor in the three-factor model was then split into two factors, resulting in a four-factor model with peer identification as the third factor and avoiding demands as the fourth. This four-factor model showed excellent fit to the data. Each of the factors in the analysis differentiated between social/interpersonal and automatic/intrapersonal functions. A two-factor (automatic and social) model was therefore also cross-validated against the derivation cohort, showing a good fit in the validation cohort, although not as good as the excellent fit of our four-factor model in this study. The factor structures found in study III were similar in some respects to previous factor analyses of FASM functions (Kaess et al., 2013; Leong et al., 2014; Lloyd-Richardson et al., 2007; Nock & Prinstein, 2005; Young et al., 2014), but differed in others.

In order to identify adolescents at risk and to develop tailored interventions, the mechanisms underlying NSSI and the context in which NSSI emerges and is maintained have become the subject of growing interest. The results from study IV in this thesis showed that NSSI frequency, gender (female), self-reported experience of emotional and physical abuse, having made a suicide attempt, prolonged illness or handicap and symptoms of depression and dissociation were all significant predictors in the final model of the automatic functions, indicating that these variables are important in understanding the mechanisms underlying the need to engage in NSSI to regulate emotions, generate feelings or to self-punish. Symptoms of depression and dissociation mediated the relationship between physical, emotional and sexual abuse and the automatic functions. Furthermore, frequency of NSSI, gender, emotional abuse, prolonged illness or handicap and symptoms of depression uniquely predicted automatic functions but not social functions. Self-reported experience of physical abuse, having made a suicide attempt, symptoms of anxiety and dissociation were significant in the final model of social functions, i.e., performing NSSI to influence or communicate with others, to avoid demands or to identify with peers. Of these,

symptoms of anxiety were uniquely associated with social, but not with automatic functions. Symptoms of anxiety and dissociation also mediated the relationship between physical abuse and performing NSSI for social reasons. A strength of this study is that it measured several different types of maltreatment experience and adversities, which were tested together in multiple regression models. Taken together, these findings lend support for specific pathways to the use of NSSI for intrapersonal/emotional regulatory and social/interpersonal regulatory reasons, although caution must be taken with regard to causality due to the cross-sectional study design.

Overall, the findings in this thesis support several aspects of the different theoretical models of NSSI that have been proposed. Results show that adolescents with NSSI, especially those with frequent episodes, have more detrimental life experiences and higher levels of trauma symptoms, such as symptoms of depression, posttraumatic stress and dissociation, compared to adolescents without any SIB, implying that NSSI serves as a coping function. Previous trauma research has shown that the sum of adverse events adds to the risk of a variety of mental health problems among children and adolescents (e.g., Finkelhor, Ormrod, & Turner, 2007; Nilsson, Gustafsson, & Svedin, 2012), and symptoms of posttraumatic stress, depression and dissociation have previously been found to be associated with both suicidal and non-suicidal self-injury in adolescents (Bridge, Goldstein, & Brent, 2006; Gould, Greenberg, Velting, & Shaffer, 2003; Lundh, Wångby-Lundh, Paaske, et al., 2011; Weierich & Nock, 2008; Zoroglu et al., 2003). The association between symptoms of dissociation and NSSI has been attributed to a high rate of traumatic life events in individuals who engage in NSSI (Gratz, 2003; Suyemoto, 1998). There is thus support for Yates' theory (2004, 2009), where NSSI is viewed as an adaptation to childhood traumatic stress. The NSSI+SA group had the highest level of adversities and trauma symptoms. The cumulative experience of multi-adversities and trauma symptoms for the group with both NSSI+SA perhaps contributes to the wish to end one's life (Brausch & Gutierrez, 2010). These results can be seen in the light of Joiner's (2005) theory of suicide, which postulates that repeated painful experiences (such as sexual and physical abuse) together with past self-injury may habituate the individual to pain and provocation, potentially leading to the ability to engage in lethal SIB in the context of thwarted belongingness and being perceived as a burden.

The results in this thesis can also be viewed in the light of Nock's (2009) integrative model of NSSI, with NSSI developing in the context of distal familial risk factors and individual vulnerabilities, causing the adolescent to need affective regulation of experiences as well as using social functions to communicate with and influence others, also within a peer context. NSSI is thus maintained through both automatic and social reinforcing properties. The functions of NSSI most often reported by adolescents in this thesis were "to stop bad feelings" and "to relieve feeling 'numb' or empty". These automatic functions could be said to represent some kind of experiential avoidance, where NSSI functions as a means of avoiding or reducing unwanted experiences (Hayes et al., 1996), which would support the EAM of NSSI postulated by Chapman et al. (2006).

To conclude, this thesis provides important information on the prevalence, characteristics and functions of NSSI in Swedish adolescents and its relationship to childhood adversities and trauma symptoms. Some methodological considerations and limitations, however, need to be mentioned and are elaborated on below.

Methodological Considerations

Some methodological concerns need to be considered when interpreting the results in this thesis. Collecting data in school settings is usually a good way to reach out to as many adolescents as possible and ensure high participation rates. At the same time, it is possible that school-based studies may lead to potentially inaccurate reporting, due to the close proximity of adolescents'

peers when filling in questionnaires together in the classroom. It is also necessary to bear in mind the possible influence from peers with regard to outspoken comments and attitudes toward the research project. The challenges of adolescent self-report in the context of self-harm have previously been expressed by Hargus, Hawton, and Rodham (2009): “the survey was self-report and vulnerable to the whims, interpretations, perspective, and self-awareness of the adolescent completing the survey” (p. 533).

The retrospective self-report method of collecting data on sensitive subjects has several challenges and limitations, one of which is being reliant on what adolescents are willing and capable of reporting explicitly (Nock & Banaji, 2007), and also with recall bias, forgetting and social desirability possibly influencing results. The time lapse between the events being measured, for example maltreatment in childhood, and the time point of the data collection may hinder accurate recall (Hardt & Rutter, 2004). For adolescents, however, this time span is not usually as long as for adults, which possibly reduces the risk of forgetting. The sensitive issue in itself can lead to variability in responses (Dube, Williamson, Thompson, Felitti, & Anda, 2004). The tendency in humans to seek meaning in memories may also affect recall concerning the timing and sequence of events (Hardt & Rutter, 2004). There is also concern whether people can give accurate reports of their cognitive processes (Nisbett & Wilson, 1977). As previously reported by Nock et al. (2009), it is plausible that aspects regarding antecedents and consequences of behaviors, such as the functions of NSSI, are not within total conscious awareness. NSSI may very well be reinforced by contingencies that are outside conscious awareness, limiting self-report as a method. In a study by Rodav et al. (2014), 59% of community adolescents endorsed “no reason that I know about, it just happens sometimes”, when asked why they had engaged in NSSI, which might illustrate the problem of conscious awareness of these processes. Self-report thus has its limitations, of which the possibility of systematic differences in accuracy of recall is one (Giuffra & Risch, 1994).

The validity of retrospective reports of adverse childhood experiences has been examined in a review by Hardt and Rutter (2004). They found that retrospective reports of abuse/neglect in non-clinical groups were likely to be valid, rather than yielding false positive accounts. The main concern in these types of studies, on the contrary, is that people tend not to report their experiences of abuse and therefore self-report tends to lead to underestimation of abuse/neglect. Furthermore, those who suffer from current impairment are more likely to report earlier adversities, which could lead to bias when groups are compared, with larger between-group differences. A central aspect in the validity of retrospective reports lies in the operationalization of the items being measured. Overall, Hardt and Rutter (2004) conclude that, despite measurement error, retrospective self-report can be considered to be valid, though retrospective recall of more subtle experiences tends to be less satisfactory (Hardt & Rutter, 2004). Research on maltreatment has previously shown that rates of maltreatment found in studies vary depending on the method used (retrospective, prospective or both). Single methods can overlook cases, and self-report in particular has been shown to under-report maltreatment. However, the most severe cases are likely to be identified by retrospective methods (Shaffer, Huston, & Egeland, 2008) and retrospective report can also provide valuable information (Kendall-Tackett & Becker-Blease, 2004). Retrospective responses to childhood abuse have furthermore shown to be fairly stable over time (Dube et al., 2004). To conclude, systematic reviews suggest that retrospective recall of childhood events can provide useful and fairly accurate data, despite its limitations and the tendency to under-report instances of maltreatment (Brewin, Andrews, & Gotlib, 1993; Hardt & Rutter, 2004).

When it comes to self-injury, there is a potential difficulty in assessing suicidal intent in self-report questionnaires. The intent to die is a crucial factor when separating suicide attempts from NSSI (Nock, 2010; O’Carroll et al., 1996; Silverman et al., 2007a, 2007b). Most instruments used

to assess SIB do not include a clear definition of suicidal intent. Research has shown that several individuals who reported having made a suicide attempt said that they did not actually want to die when asked to state the lethality or specific intent of their suicide attempt (Kessler, Borges, & Walters, 1999; Nock & Kessler, 2006). It is thus important in suicide research to also assess the actual intent to die (Nock & Kessler, 2006), to avoid so-called false positive results (Plöder, Kralovec, Yazdi, & Fartacek, 2011). Plöder et al. (2011) showed that the rate of suicide attempters was reduced after probing questions were added. Probing questions also identified false negatives, thus both false positives and false negatives can potentially undermine validity. Despite this, Mazza, Catalano, Abbott, and Haggerty (2011) concluded that retrospective measures of suicide attempts can be considered a valid method of assessment.

The high variability in NSSI prevalence across studies raises questions about reliability and validity when measuring NSSI. A recent meta-analysis showed that methodological factors influence prevalence rates in NSSI, contributing over half of the heterogeneity in results (Swannell et al., 2014), with checklists resulting in higher rates (Muehlenkamp et al., 2012; Swannell et al., 2014). High rates of NSSI were reported by adolescents in this thesis. Possible factors contributing to this are: the use of checklist format with quite a large number of NSSI methods specified, anonymity of participants, self-administered questionnaire and a specified research focus on NSSI, factors which have all contributed to heterogeneity and which were associated with higher prevalence rates in the univariate analysis in the study by Swannell et al. (2014). The format (checklist), anonymity and the period assessed remained significant in the multivariate analysis. In a study by Bjärehed and colleagues (2013), only about half of adolescents who had reported self-injury in a previous checklist questionnaire revealed NSSI in a follow-up interview. Furthermore, a majority of cases were not assessed as very serious. Should this be interpreted as false positives in checklists, or an under-reporting of NSSI in the interview setting? It has previously been documented (e.g., the review on suicidal phenomena by Evans, Hawton, Rodham, & Deeks, 2005) that where sensitive topics are concerned, prevalence rates are lowered when subjects are identified, such as during interviews, which was also confirmed by the meta-analysis by Swannell et al. (2014).

Some checklists of NSSI items cover a wide range of NSSI methods, which increases prevalence, as does the inclusion of milder types of NSSI, such as picking at wound or biting lip (Nock, 2010), both of which are included in FASM. Swannell et al. (2014) concluded that checklists where each item has to be processed may in fact generate more accurate results, compared to single item questions that are based on free recall and lack any form of prompting. Different aspects of memory processes may be involved, which can help to interpret the discrepancy in results between single SIB items vs. checklists. Checklists most probably trigger information retrieved from the episodic memory, whereas the single item is more probably processed by the semantic memory (Lundh, Bjärehed, & Wångy-Lundh, 2013; Wheeler, Stuss, & Tulving, 1997) and perhaps touches on issues of implicit identification. Do I identify with self-injury and being a self-injuring person (Nock, 2009; Nock & Banaji, 2007)? A person who does not think of himself/herself as a self-injurer might answer in the negative to a single SIB item question, depending on whether they implicitly identify with self-injury, and at the same time affirm having performed different types of NSSI exemplified in a checklist.

Yet another methodological issue concerns the psychometric qualities of NSSI questionnaires. In several studies on NSSI, including the present thesis, the frequency and methods of NSSI in checklists have been summed up and added. This approach is based on the assumption that the added methods all relate to the same underlying construct, so called unidimensionality, which is seldom reported in NSSI studies (Latimer, Meade, & Tennant, 2013). However, Latimer et al. (2013) recently showed in their study of six NSSI scales that there is support for

unidimensionality of the NSSI items within the scales, which does in fact justify adding different methods to form a total score.

More items in FASM represent social functions and fewer represent automatic functions, compared to some of the other instruments that assess NSSI functions (such as ISAS and OSI). The relative sparsity of automatic functions may influence the factor structure. Klonsky and Glenn (2009) have pointed out that FASM does not assess several of the NSSI functions that have been documented in the literature (such as sensation seeking, coping with suicidal thoughts and interpersonal boundaries, which are included in ISAS). Nock and Cha (2009), on the other hand, argue that this perspective uses a much broader definition of the term function, describing the purpose of the behavior more widely (boundary definition, for example) without operationalizing the antecedents and consequences of the behavior within the framework of learning theory.

In this thesis the same method (self-report) was used, and therefore shared method variance may partly account for the correlations among studied variables. A combination of methods would have been optimal (Prinstein, Nock, Spirito, & Grapentine, 2001) to reduce the influence of shared method variance. With the large sample size used in this thesis, statistical significance in hypothesis testing is likely to occur. It is therefore important to also present effect size and to use other fit indices than χ^2 for factor models, as well as correcting for multiple comparisons when doing repeated hypothesis testing on the same sample.

Ethical Issues

Concern has been voiced that research on SIB can be harmful to adolescents, possibly inducing discomfort and even triggering acts of NSSI or suicidality. However, previous empirical studies have not been able to find support for such an adverse effect (Deeley & Love, 2010; Friedman, 2006; Gould et al., 2005; Mathias et al., 2012). In a recent study with an experimental design, specifically aimed at examining the effects of NSSI research, no short-term iatrogenic effects were found (Muehlenkamp et al., 2014). Empirical data is thus emerging that call into doubt harmful effects, and ethical judgments need to be based on results from these studies. In this thesis four schools did not wish to participate in the data collection due to concern that the subject of SIB would harm the adolescents, creating possible distress and problems in the schools. Some individual teachers were also critical of the topic, despite the fact that the school board had given permission for school participation. Overall, however, most school staff were positive.

Care was taken to give adolescents information about counseling alternatives if the data collection caused distress, but we have no way of knowing if, or how many, adolescents actually initiated any such contact adjacent in time to the data collection. Students were also encouraged to contact the researchers with questions when we stayed in a school collecting data during a whole day. Only a few adolescents did, but none presented a query concerning their own SIB (but instead raised issues related to family problems, medication, suicide of family member or neuropsychiatric difficulties). One can only speculate whether this meant that the adolescents did not feel the need to talk to us about their self-injury, or if the method used in this thesis was inappropriate for reaching out to adolescents in need. Perhaps a more active stance is needed on the part of the researcher. Plener, Libal, Keller, et al. (2009), for example, were more active in their approach and offered to contact adolescents who filled in a note and enclosed it with the questionnaire. However, despite this more active approach, very few adolescents took advantage of the opportunity, which is similar to our experience. Extra care was also taken in the data collection of this thesis by adding a number of irrelevant questions at the end of the questionnaire so as not to reveal those who needed more time to fill in answers due to more self-injury. The questions on SIB were placed in the middle, with less sensitive questions in the beginning and end, in line with general recommendations (Nock, 2010). The voluntary aspect, in other words,

that participation was completely voluntary and that the adolescents could cease participation at any time, was also stressed, both in the letter of information sent before the data collection, and again during the actual collection.

Limitations

Data was gathered through retrospective self-report, which has well-known limitations, for example with forgetting and recall bias, elaborated on above. Self-report measures were not validated against other sources of information, such as clinical interviews, which would have strengthened results. There is also a lack of data on general psychopathology and differential diagnoses in the sample. There is therefore no way of discriminating between adolescents with NSSI with or without symptoms of BPD, for example, which is a limitation since symptoms of BPD can potentially influence the reported functions of NSSI (Klonsky & Glenn, 2009; Sadeh et al., 2014). Another limitation of this thesis is that adverse life events refer to lifetime prevalence, whereas the questions about NSSI and its functions refer to the last year and the questions about trauma symptoms refer to the present time. Muehlenkamp and Gutierrez (2007) have voiced concern that such a divergence could mean that adverse life events and trauma symptoms are perhaps not close enough in time to the actual SIB. Their conclusion, however, was that this would probably lead to conservative estimates. Furthermore, due to this divergence it is possible that NSSI may lead to increased depressive symptoms, for example, instead of the presumed relationship where depression precedes NSSI. The evidence here is contradictory; although one longitudinal study (Lundh, Wångby-Lundh, Paaske, et al., 2011) found evidence for a bidirectional relationship in girls, with depressive symptoms being a risk factor for increased self-harm a year later and self-harm a risk factor for increased depressive symptoms a year later, another longitudinal study (Marshall et al., 2013) found depression to be a predictor of NSSI but not the other way around. The cross-sectional design of this thesis rules out any conclusions involving causality, which is especially evident in study IV where prediction and mediation are only used in a statistical sense. Since the findings are based on data from a community sample of adolescents, they might be less generalizable to clinical samples with more severe psychopathology and cannot be generalized to other countries and cultures either.

NSSI criteria in DSM-5

There is as yet no gold standard for assessing NSSI, and researchers have had to combine different questions/instruments to assess the proposed DSM-5 NSSI diagnostic criteria (APA, 2013; Manca et al., 2014). The fact that no psychometric data are available on specific combinations of NSSI criteria questions (Manca et al., 2014) can lead to less valid results. The design of the present thesis does not allow for discrimination or overlap between a potential NSSI diagnosis and other disorders. Also, sensitivity and specificity for the diagnosis of NSSI disorder could not be estimated. It should also be noted that the prevalence rate might have been different if interviewing methods had been used, and also if other self-assessment measures than FASM had been used with fewer (or other) examples of NSSI.

The manner in which criteria and the full diagnosis were operationalized in study I also has its limitations. According to Manca et al. (2014), the functions in instruments such as FASM, ISAS and OSI can be used to assess the contingency criterion, but assessment of the states that precede the act of NSSI is potentially more problematical. For the assessment of APA's (2012) criterion B1 ("Psychological Precipitant: Interpersonal difficulties or negative feelings or thoughts..."), i.e., criterion C1 in DSM-5 (APA, 2013), the item "to relieve feeling 'numb' or empty" and "to stop bad feelings" were used. This is not optimal, since negative feelings might have been present immediately before self-injury without necessarily causing the individual to resort to self-injury to stop them (i.e., the self-injury had a different function). A better approach would have been to ask participants how they were feeling just before self-injuring. Another aspect worth mentioning

is the choice of a minimum of eleven instances of NSSI thoughts to operationalize the criterion “Preoccupation: Thinking about self-injury occurs frequently...” (APA, 2012). One can argue that ≥ 11 times is perhaps not synonymous with “frequently” when it comes to thoughts. However, since this was the highest fixed answer category it was not possible to assess higher frequencies. The frequency of NSSI in criterion A is stated as five or more days. In study I, five or more times was used as an operational definition, since information about the number of days was lacking. Regarding criterion D (APA, 2012; i.e., criterion E in APA, 2013), it was not assessed whether adolescents self-injured during states of psychosis or delirium, nor whether they ever engaged in NSSI when not intoxicated, which is another limitation.

Adverse life events and trauma symptoms

Onset, duration, frequency and further information regarding adverse experiences are lacking in study II and IV of the present thesis. The single item assessment of maltreatment/abuse experiences is another limitation, since such experiences are seldom clear-cut and categorical (Wachter et al., 2009) and single item questions are also open to subjective interpretations by the adolescents (Swannell et al., 2014). The TSCC measures self-reported trauma symptoms, and validated diagnoses of posttraumatic stress disorder or depression are lacking. A comprehensive interview to assess posttraumatic stress might have yielded different results.

Suicidal and non-suicidal self-injury

Another limitation concerns the categorization of individuals into SIB groups in study II. Since categorization was based solely on self-report, the distinction between NSSI and suicide attempts was not always clear. Participants were not interviewed in order to clarify their understanding of the questions pertaining to self-injurious behaviors and the meaning of their answers, which would have been optimal. Such an approach might have influenced group categorization. Seventeen adolescents gave ambiguous answers to the suicide intent questions. In accordance with Jacobson et al. (2008), the nonzero rule (O’Carroll et al., 1996) was applied in these cases, which means that they were categorized as belonging to either the SA or the NSSI+SA group, whereas a more strict definition of suicide attempt would perhaps have placed them in the no SIB group or the NSSI group instead. When sufficient information about NSSI frequency was not available, adolescents were placed in the NSSI 1-4 times group, which means that adolescents with more frequent NSSI can potentially be found in this group. It is worth mentioning with regard to study II that the lack of significant differences for the SA group could be attributed to the small *N* for this group and lack of power, and should therefore be interpreted with caution.

Drop-out

It is possible that those not present at the time of data collection were especially troubled adolescents with high absenteeism from school, resulting in a systematic bias in drop-out. There were higher drop-out rates among adolescents belonging to the so-called individual program, for example, due to the fact that they were absent from school, compared to participants from the vocational or theoretical education programs.

Excluded cases

In study II there was a larger proportion of adolescents who reported a suicide attempt (SA and NSSI+SA groups) among those excluded due to incomplete questionnaires, although the difference was not statistically significant. Those excluded differed from those included on demographics such as type of education, parental occupation status, living conditions and perception of family’s financial situation. It is therefore likely that the excluded adolescents represented a risk group, with perhaps greater issues in trauma and adverse experiences. This may also be one reason why they did not answer a sufficient number of questions on LYLES and TSCC. Regarding ethnicity, significantly more adolescents among those excluded were born in countries other than Sweden as were their parents, probably reflecting language barriers that

hindered them from filling out an extensive questionnaire. Exclusion probably led to conservative estimates of group differences.

The adolescents that were excluded from analysis in study III and IV (252 and 272 respectively) due to missing items, mainly on FASM functions, did not differ from those included regarding background demographics such as gender, parents' or own country of origin, education, parental occupational status or perception of the family's financial situation. However, there were significant differences regarding self-injury status. Those excluded reported less frequent NSSI, as well as less moderate/severe NSSI, as defined by Lloyd et al. (1997). Many of those with less frequent and minor NSSI had not completed any of the function items in FASM. It is possible that they constituted a group that had experimented with NSSI once or twice and did not regard the specified functions as applicable. In all likelihood this meant that those with non-significant NSSI were excluded. This interpretation is supported by Lloyd-Richardson et al. (2007), who showed that minor injurers were more likely to deny engaging in NSSI for any of the reasons listed in FASM, as compared to moderate/severe injurers. This needs to be taken into account when discussing the generalizability of the results beyond the study sample. However, imputation procedures of missing data in study III did not produce any different results.

Clinical Implications

Some clinical implications and recommended therapeutic approaches can be extracted based on the results in this thesis. Since NSSI is highly prevalent in adolescents, health care professionals and school staff need to routinely assess for NSSI. To achieve these means, clinicians can benefit from having access to easily administered and structured instruments, for example FASM and ISAS, to assess NSSI frequency and functions, as well as other contextual information. Translated versions are presently spreading to several different countries. The results of this thesis contribute to the discussion of a potential DSM-5 diagnosis of NSSI and the classification of NSSI behavior into a meaningful clinical construction, allowing more stringent criteria for assessment as well as scientific and clinical communication. Non-suicidal and suicidal behaviors co-occur and it is thus important to inquire into the possible presence of NSSI when assessing and treating adolescents with suicidal behavior, as well as assessing suicide ideation and plans in adolescents engaging in NSSI. It is important to pay attention to experiences of adverse life events, especially of an interpersonal nature, as well as trauma symptoms when working with adolescents with SIB. Hence, frequent NSSI in particular can indicate a need to inquire about the adolescent's trauma history. It is possible that experiences of this kind can influence specific pathways towards the need to engage in NSSI to regulate emotions and/or to communicate with others. In this thesis, experiences of physical abuse, a previous suicide attempt and symptoms of dissociation were found to be involved in the pathway to engaging in NSSI for regulating both emotional and social experiences. These factors can thus be indicative of a broad treatment approach aimed at emotion regulation skills as well as interpersonal skills in the context of the caregiving environment, in which it is equally important to attempt to reduce adversities, conflict and criticism and instead encourage validation and also pay attention to low-key attempts of social signaling. Furthermore, experiences of emotional abuse and symptoms of depression in adolescents with NSSI can potentially alert clinicians to interventions aimed at helping the adolescent and caregivers with emotion regulation skills, in order to reduce the need for NSSI to regulate emotions, generate feelings and to self-punish.

Adolescents engage in NSSI for a reason, and in order for them to be able to replace NSSI with alternative (functionally equivalent) behaviors it is important to understand the specific context in which NSSI has developed and is maintained. In order to understand the mechanisms underlying the need to engage in NSSI to regulate emotional and/or social experiences it is not only necessary to assess experiences of negative life events but also more proximal individual

psychopathology, such as the level of trauma symptoms, since they can have a mediating effect on the complex relationship. An assessment of the specific reinforcing functions of NSSI can be helpful as a guide to functionally relevant individualized treatment strategies.

This thesis has built further on earlier empirical results, showing affect regulation to be a prevalent reason for engaging in NSSI and highlighting the importance of addressing this issue in clinical work. A highly self-critical adolescent who self-injures to punish herself/himself would, for example, potentially benefit from interventions that address issues of self-worth. Similarly, the need to use NSSI to regulate emotions would in all likelihood diminish after emotion regulation skills have been increased. Although not as frequent as affect regulation, social functions are not unusual in adolescent community samples. Interpersonal reasons, such as gaining attention, tend to be more easily disregarded and frowned upon, and sometimes interpreted as “acts of manipulation”, which is unfortunate. It is important that social functions are considered in the context of social signaling (Hagen et al., 2008; Nock, 2008), where earlier, less intense signals of distress have perhaps not been expressed in an effective way for that particular situation and/or not responded to in an adequate manner. When NSSI is performed to influence others, this should be targeted in treatment. With regard to peer identification as a function of NSSI, it can be necessary to also illuminate the reinforcing peer context, although far less treatment has been directed toward this function. A therapeutic approach that is characterized by an awareness that NSSI serves several functions is therefore essential, thus avoiding yielding to one-sided generalized interpretations. Psychoeducation about NSSI, its functions and pros and cons, will potentially reduce criticism and unsympathetic responses towards the adolescent. In all likelihood, several function-specific interventions need to be combined.

Future Directions

Future work in the research field of NSSI would benefit from a unified conceptualization of NSSI with standardized assessment measures in order to facilitate comparisons and achieve more consistent results. The proposed NSSI diagnostic criteria (APA, 2013) is a step towards a mutually agreed upon conceptualization (Swannell et al., 2014). Swannell et al. (2014) suggested that an explicit definition, including the wording “non-suicidal”, “direct” and “intentional”, should be presented in epidemiological NSSI research so that the term is clearly operationalized to research participants. Empirical studies are only just emerging and the prevalence rates of a potential DSM-5 NSSI disorder need to be verified in both clinical and community groups of adolescents by other methods than self-report, such as interviews, parental reports and clinical assessment. There is as yet no gold standard to assess NSSI in DSM-5 and the development of such diagnostic measures would be a welcome contribution, facilitating future empirical research concerning the reliability and validity of a potential diagnosis. Perhaps certain NSSI criteria need to be somewhat revised, as for example the wording of the distress/interference criterion, or at least the inclusion of more detailed guidelines on how it should be assessed (In-Albon et al., 2013; Lengel & Mullins-Sweatt, 2013; Odelius & Ramklint, 2014a). Longitudinal studies are also needed in order to examine risk factors and the prognosis of the NSSI criteria, and its relationship to diagnostic neighbors and suicidal behaviors over time (Glenn & Klonsky, 2013; Selby et al., 2012).

Longitudinal studies are also needed in building further on the work of the functions of NSSI. Future research that provides evidence of function-specific risk factors would also be of importance in prevention and functionally relevant individualized treatment interventions. Future research on the factor structure of NSSI functions needs to be extended to large clinical samples before results can be generalized to clinical practice. As yet there is a lack of evidence for a specific psychological treatment of NSSI. This must have high priority for future research, which would benefit from having functionally guided research questions (Bentley et al., 2014). A

fruitful way to use the factor structure of NSSI functions would be to evaluate treatment interventions. These interventions could be aimed at increasing emotional awareness and regulation skills, for example, as well as improving communication and encouraging caregivers to respond to less intense forms of communication. An examination of the effect of this treatment could show whether such interventions can reduce the need to use NSSI to regulate affect and/or to influence social relationships over time.

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Appendix

The Swedish version of the Functional Assessment of Self-Mutilation (FASM)

A. Under det senaste året, har du ägnat dig åt något av följande beteenden för att avsiktligt skada dig själv (kryssa för alla alternativ som stämmer):

	Nej	Ja	Hur många gånger?	Har du fått medicinsk vård?
1. skurit eller karvat i din hud				
2. har du slagit dig själv med avsikt				
3. dragit ut ditt hår				
4. tatuerat dig själv				
5. pillat på ett sår				
6. bränt din hud? (t.ex. med en cigarett, tändsticka eller annat hett föremål)				
7. stuckit föremål under dina naglar eller hud				
8. bitit dig själv? (t.ex. din mun eller läppar)				
9. pillat på ställen på din kropp ända tills de började blöda				
10. skrapat din hud				
11. suddat din hud				
12. annat: _____				

B. Om inte under det senaste året, har du **NÅGONSIN** genomfört någon av handlingarna ovan?

_____ Ja
_____ Nej

Om du svarat ja på något av beteendena ovan under det senaste året vänligen fyll i frågorna (C – H) nedan.

C. Medan du utförde någon av handlingarna ovan, försökte du ta livet av dig?

_____ Ja
_____ Nej

D. Hur länge tänkte du på att utföra handlingen/ handlingarna ovan innan du faktiskt gjorde det?

_____ Inte alls.
_____ Några minuter
_____ Mindre än 60 minuter
_____ Mer än 1 timme men mindre än 24 timmar
_____ Mer än en dag men mindre än en vecka
_____ Mer än en vecka.

E. Utförde du något av beteendena ovan medan du tog droger eller alkohol?

_____ Ja
_____ Nej

F. Upplevde du smärta under självskadandet?

_____ skarp smärta
_____ måttlig smärta
_____ liten smärta
_____ ingen smärta

G. Hur gammal var du när du först skadade dig själv på detta sätt? _____

H. Skadade du dig själv på grund av någon av anledningarna som listas nedan (kryssa för alla anledningar som stämmer):

0 Aldrig	1 Sällan	2 Ibland	3 Ofta
Anledningar:			Skattning
1. för att undvika skola, arbete eller andra aktiviteter			
2. för att lindra känsla av tomhet eller avdomning			
3. för att få uppmärksamhet			
4. för att känna något, även om det var smärta			
5. för att undvika att behöva göra någonting obehagligt du inte vill göra			
6. för att få kontroll över en situation			
7. för att försöka få en reaktion från någon, även om det är en negativ reaktion			
8. för att få mer uppmärksamhet från dina föräldrar eller vänner			
9. för att undvika att vara med människor			
10. för att straffa dig själv			
11. för att få andra människor att bete sig annorlunda eller ändra på sig			
12. för att vara lik någon du respekterar			
13. för att undvika bestraffning eller betala konsekvenserna för något			
14. för att stoppa dåliga känslor			
15. för att få andra att veta hur desperat du var			
16. för att känna dig mer delaktig i en grupp			
17. för att få dina föräldrar att förstå eller lägga märke till dig			
18. för att ge dig själv något att göra när du är ensam			
19. för att ge dig själv något att göra när du är med andra			
20. för att få hjälp			
21. för att göra andra arga			
22. för att känna dig avslappnad			
23. annat:			

Tack för dina svar!

Publications

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