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DELIBERATE SELF-HARM – CHARACTERISTICS, CLINICAL CORRELATES AND INTERVENTIONS

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Deliberate self-harm – characteristics, clinical correlates and interventions

THESIS FOR DOCTORAL DEGREE (Ph.D.)

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For Axel and Cornelia, with love

ABSTRACT

Background: Deliberate self-harm (DSH) and nonsuicidal self-injury (NSSI) are serious global health problems prevalent among both community and clinical samples. Several studies have suggested that aggression towards others may be a clinically relevant correlate in self-harming individuals, but the association is still unclear. Current research suggests that NSSI primarily serves an emotion regulating function, but there are few treatments directly targeting NSSI available. Thus, there is currently a need for research on the characteristics, clinical correlates and treatments for DSH and NSSI.

Aims: The general aim of this thesis was to study DSH and NSSI and its association with violence towards others and to evaluate the utility of a short adjunctive treatment for NSSI. The specific aims of the individual studies were:

- to compare suicidal severity and use of interpersonal violence in a group of suicide attempters with and without a history of NSSI (**Study I**).
- to investigate the association between DSH and perpetration of violence towards others (**Study II**).
- to evaluate the utility of a short, group-based behavioural treatment targeting emotion dysregulation and NSSI (**Study III**).
- to examine what patient characteristics predicted outcomes in the treatment evaluated in Study III (**Study IV**).

Methods: A cross sectional study was conducted examining the impact of comorbid NSSI in a group of suicide attempters (**Study I**). The unique association between DSH and violent crime was investigated through Cox proportional hazards regressions in a survival analysis based on register data (**Study II**). The utility and feasibility of a short, adjunctive treatment for NSSI (emotion regulation group therapy, ERGT) was evaluated in an open, uncontrolled pilot study. Within-group effects and interaction effects of predictors on outcome at post treatment and six-month follow-up was analysed using multilevel generalized estimated equations negative binomial and linear mixed regression models (**Study III** and **IV**).

Results: Suicide attempters with comorbid NSSI engaged in more violent and frequent suicide attempts, and had used interpersonal violence towards others to a significantly higher extent than suicide attempters without NSSI. A significant and unique association between DSH and violent crime was found suggesting a shared vulnerability between violence towards oneself and others. ERGT was associated with significant reductions in NSSI, emotion dysregulation and other psychiatric symptoms at post-treatment and six-month follow-up. Analysing predictors of outcome revealed that ERGT may also be useful for individuals with high frequency of NSSI, and that comorbidity was negatively associated with the maintenance of treatment gains.

Conclusions: Engagement in deliberate self-harm and violence towards others are associated, although what characterizes this shared vulnerability to violence against one self and others is yet unclear. ERGT may be a useful and transportable treatment for individuals with NSSI.

LIST OF SCIENTIFIC PAPERS

I. Sahlin, H., Moberg, T., Hirvikoski, T., & Jokinen, J. (2015). Nonsuicidal self-injury and interpersonal violence in suicide attempters. *Archives of Suicide Research, 19*(4): 500-509.

II. Sahlin, H., Kuja-Halkola, R., Bjureberg, J., Lichtenstein, P., Molero, Y., Rydell, M., Hedman, E., Runeson, B., Jokinen, J., Ljótsson, B. & Hellner, C. (2017). Association between deliberate self-harm and violent criminality. *JAMA Psychiatry, 74*(6): 1-8.

III. Sahlin, H., Bjureberg, J., Gratz, KL., Tull, MT., Hedman, E., Bjärehed, J., Lundh, L-G., Jokinen, J., Ljótsson, B. & Hellner, C. (2017). Emotion Regulation Group Therapy for Deliberate Self-Harm: A Multi-Site Evaluation in Routine Care using an Uncontrolled Open Trial Design. *BMJ Open*, *7*: e016220.

IV. Sahlin, H., Bjureberg, J., Gratz, KL., Tull, MT., Hedman, E., Bjärehed, J., Lundh, L-G., Jokinen, J., Hellner, C. & Ljótsson, B. (submitted manuscript). Predictors of improvement in an open trial multi-site evaluation of Emotion Regulation Group Therapy.

CONTENTS

LIST OF ABBREVIATIONS

DSH	Deliberate self-harm
NSSI	Nonsuicidal self-injury
DSM	Diagnostic and Statistical Manual
BPD	Borderline personality disorder
ASPD	Antisocial personality disorder
ERGT	Emotion regulation group therapy
SUD	Substance use disorder
DSHI	Deliberate self-harm inventory
DERS	Difficulties in emotion regulation scale

1 INTRODUCTION

I began working with self-harming women with borderline personality disorder in 2002 as a clinical psychologist and continued to do that for the next 12 years. I have thoroughly enjoyed working with dialectical behaviour therapy (DBT) with these patients, patients that have been neglected and stigmatized within the psychiatric system for many years, and still are, unfortunately. One thing that has been striking during my years of training and working with DBT, are the many dedicated clinicians I have met. Clinicians who had invested a lot time and energy in learning DBT, a treatment they hoped would better help these patients than the treatments they had previously used. Most of them had implemented DBT into their clinics on their own initiative, creating study groups and forming treatment teams with other interested clinicians. A grassroots initiative if you will. Without this dedication, many self-harming patients would not have had access to the treatments that are available today, such as DBT and mentalization based therapy.

Against this background, it has been such a joy for me to have been given the opportunity to participate in a government funded effort to increase access to treatment for self-harm through the implementation and structured evaluation of a novel treatment into Swedish psychiatric outpatient clinics. To see that the dedication and initiative comes, this time, not only from clinicians but from our own government in the form of the National Self-harm project. And in implementing and evaluating ERGT, I have met yet many more dedicated clinicians.

To have changed paths, from clinic to research has not been simple, but it has been extremely rewarding. I know that my clinical background has helped me form my research questions, particularly the focus on aggression in self-harming women and I hope that the research I have done will help self-harming patients and the clinicians working with them, in the future.

Stockholm, winter 2018.

2 BACKGROUND

2.1 SELF-HARM, DELIBERATE SELF-HARM AND NONSUICIDAL SELF-INJURY

Self-harm is a behaviour that involves the deliberate causing of pain or injury to oneself – usually as a way of coping with distressing or painful feelings and thoughts, and may also include attempted suicide. Self-harm has gained increasing attention in the research field over the past decades, as its prevalence in and negative impact on both community and clinical populations has become more evident[1,2].

2.1.1 Definition of the terms

As self-harm came into focus as a clinical phenomenon in the early 1950's, it was initially conceptualized as "attempted suicide". However, clinicians and researchers soon realized that some of these attempted suicides were conducted without suicidal intent, and new terms were developed to better account for these differences. This led to a conceptual confusion as terms such as "*parasucide*", "*self-mutilation*", "*self-injury*", "*attempted suicide*" and "*deliberate self-harm*" have been used interchangeably when studying non-fatal deliberate self-harm behaviour and attempted suicide. The term deliberate self-harm (DSH) has primarily been used within European research, and refers to non-fatal behaviours aimed at hurting oneself through self-injury or self-poisoning[3] regardless of intent (i.e., both suicidal and non-suicidal). DSH does not include other potentially self-harming behaviours such as starving oneself, exposing oneself to sexual (or other) risk, using drugs or alcohol, or piercing or tattooing one's body. Self-harming behaviours included in DSH have been studied in European epidemiological studies since the mid 1970's[4,5] and has accumulated a large empirical base, resulting in clinical guidelines, interventions and treatments[3,6,7]. Researchers within this field have argued for the inclusion of both suicidal and non-suicidal self-harm due to difficulties in assessing intent within DSH, and because research shows that motivation for DSH may be both suicidal and non-suicidal at the same time, or may vary within an individual over time[8,9]. In recent years, several European researchers have suggested that the word "deliberate" (thought to distinguish voluntary from accidental self-harm) be removed when conceptualizing self-harm, as it has been experienced as increasing stigma around self-harm. The term "deliberate" suggests a degree of control and wilfulness in the self-harming individual, although many of them experience that self-harm is not a choice but an unstoppable urge, and others self-harm during dissociative states, thus precluding "deliberation" when engaging in the self-harm behaviour[3].

Research on self-harm in the US began to flourish with the publications on parasuicidal behaviours in women with borderline personality disorder (BPD) conducted by Marsha Linehan[10-12]. Her behavioural conceptualization of self-harm as serving an emotion regulating

function in individuals with BPD and her development of dialectical behaviour therapy (DBT) inspired a non-judgmental view on self-harm and directed a new line of research and treatment. Although many North American researchers have used the term parasuicidal behaviour to describe both suicidal and non-suicidal self-harm, other terms such as *self-injury*, *self-mutilation, self-injurious behaviour* and *deliberate self-harm* have also been applied. To confuse matters even more, the term DSH has been used when actually studying self-harm performed without suicidal intent and not including poisoning or intoxications (see for example[13], and **Studies III** and **IV** in this thesis).

In more recent years, the term NSSI has been introduced as a separate diagnosis in the "Conditions for further studies" in the DSM-5[14]. Before then, self-harm was only described as one of nine diagnostic criteria for BPD (criteria no 5; "*recurrent suicidal behaviour, gestures, or threats, or self-mutilating behaviour*") leading to self-harming individuals oftentimes being erroneously diagnosed with BPD[14]. The construction of the NSSI-disorder was done in an effort to distinguish non-fatal, non-suicidal DSH from non-fatal self-harm with suicidal intent, to increase diagnostic precision and to promote research.

NSSI is restricted to include self-harm behaviours directed to the skin and is defined as "the deliberate, direct destruction or alteration of body tissue without conscious suicidal intent, but resulting in injury severe enough for tissue damage (e.g., scarring) to occur" (p. 253)[13]. Researchers advocating NSSI as a separate diagnostic and clinical entity claim that there is a qualitative difference to self-harm behaviours performed to manage "everyday" emotions or frustrations as compared to self-harm in order to end one's life[15]. Also, NSSI has been found to be highly prevalent in both community and clinical samples, indicating that it is a mental health problem in its own right, especially among adolescents[16]. European researchers have to some extent begun investigating NSSI as a separate phenomenon when studying DSH, in more recent years (for an example, see[17]). However, some conceptual confusion regarding these terms remains in the literature.

Thus, NSSI is a specific form of DSH where nonsuicidal intent is assessed and confirmed by the individuals engaging in the behaviour. In the present thesis, NSSI was studied in **Study I**, **III** and **IV**, whereas DSH was studied in **Study II,** where intent was not possible to assess due to the large-scale registry based design.

2.1.2 Prevalence and course

Prevalence rates of DSH in community samples have been estimated to 13% in adolescents who have engaged in DSH once and 7% in adolescents who have self-harmed repeatedly. For adults the rate has been estimated to 4.6-6.6%[3]. Although prevalence rates are difficult to establish due to the conceptual differences described above, and the many different methodologies used when assessing self-harm, a systematic review, meta-analysis and meta-regression of NSSI found a pooled prevalence rate in non-clinical samples to be around 17% in adolescents and 5.5% in adults[18]. In clinical samples, DSH has been studied most

extensively (compared to NSSI), and findings show that DSH is prevalent in adolescent clinical samples (30-40%)[19] and adult psychiatric populations (20-50%; also including suicidal ideation)[20]. Among individuals with BPD, rates up to 75% have been reported[21]. Research has shown that the incidence of NSSI and DSH has increased among children and adolescents in the past years[2].

Both DSH and NSSI typically debut between 12 and 14 years of age and is most prevalent among 14-24 year olds[22,23]. Most studies indicate that girls debut earlier than boys[24,25]. The natural course of self-harm was investigated in a multi-wave cohort study of a community adolescent sample in Australia, and showed that most adolescents with DSH spontaneously remit by early adulthood[26]. However, those who did not remit, but continued into adulthood showed more frequent and versatile (i.e., using several types of) DSH and higher levels of emotional dysregulation[27].

2.1.3 Gender differences

Although DSH and NSSI is more prevalent among women than men in most studies[15,28,29] some studies have challenged that notion[24,30]. However, in a recent meta-review, women had a small but significantly higher odds ratio of engagement in NSSI, especially in studies conducted in clinical samples[31]. Also, there is some evidence that women engage in more frequent DSH or NSSI – typically cutting and scratching – whereas men engage in more low frequency NSSI or DSH of no specific method[25,31].

2.1.4 Characteristics and clinical correlates

DSH and NSSI are associated with both externalizing and internalizing problems in adolescents and adults. Adolescent engagement in DSH is associated with comorbid depression, anxiety, anti-social behaviours, high-risk drug and alcohol use and smoking[26] and is strongly associated with concurrent and future suicide attempts[17,32].

In adults, DSH has primarily been associated with BPD, a psychiatric disorder characterized by emotional instability, interpersonal difficulties, and identity disturbance[33]. However, as the interest for self-harm as a clinically relevant phenomenon in its own right has increased, recent research suggests that DSH and NSSI are prevalent in several patient populations not meeting criteria for BPD, e.g., other personality disorders, post-traumatic stress disorder (PTSD), substance use, eating disorders and mood- and anxiety disorders[16,34,35]. DSH and NSSI can also occur in the absence of any psychiatric comorbidity[36].

Interpersonal difficulties are highly relevant to both DSH and NSSI, and childhood abuse and neglect are distal risk factors for both[37,38]. Several studies have found a lack of family support and negative feelings for one's parents or caregivers to be associated with DSH and NSSI in adolescents[39-43]. The role of lack of perceived peer support is still unclear, where some

studies have found significant associations with NSSI and others have not[40]. Also, interpersonal difficulties, such as separation or conflicts, often trigger DSH and NSSI, and is one of the highest ranking self-reported problems among adults presenting to the emergency department following DSH[44,45]. It has been suggested that interpersonal triggers may initiate a first episode of self-harm, and that other factors may influence repetition of self-harm, such as emotion dysregulation or lack of family support[39].

Substance abuse, particularly alcohol misuse, is highly prevalent among self-harming individuals[46], and in a recent study from the UK, overconsumption of alcohol had increased as a self-reported problem among treatment seeking adults in the community[44].

Elevated self-reported levels of aggression have been found in several studies of individuals with DSH and NSSI and[17,47-49]. In a recent epidemiological prevalence study, adolescents with DSH and attempted suicide had higher levels of conduct disorder and intermittent explosive disorder than adolescents with suicidal ideation only[50]. In a longitudinal birth cohort study, early DSH (before age 24) was associated with a doubled risk for domestic abuse, criminal conviction and child removal by the social services compared to those without attempted suicide[51]. Interestingly, there were no gender differences.

Thus, there are several clinical correlates associated with DSH and NSSI, and violence or aggression seems to be one such clinically relevant correlate that has not been extensively studied. Also, population based studies on psychiatric and clinical correlates of DSH are scarce, and gender differences are rarely investigated due to small, clinical samples. Against this background, **Study I** and **II** in this thesis sought to examine the role of interpersonal violence in DSH and NSSI.

2.1.5 Predictor of suicide

DSH includes attempted suicide, which is strongly linked to future completed suicide[52-54]. However, NSSI has also been identified as a strong risk factor for future suicidal behaviour[30]. Suicidal behaviours are complex and range over a broad spectrum of injury and severity and encompass both completed and attempted suicide as well as suicidal ideation and NSSI[55]. While NSSI, as previously mentioned, includes self-harm directed at bodily tissue and performed without suicidal intent, suicidal behaviours (i.e., attempted and/or completed suicide) are defined by the intention to terminate one's own life[56]. Although NSSI and attempted suicide often co-occur and share several features, such as regulating both intra- and interpersonal distress they also differ in several ways; regarding for example intent, frequency and lethality. NSSI has been associated with increased risk for suicide attempts across different clinical and sociodemographic groups (for a review, see[57]). DSH and NSSI have repeatedly been found to predict attempted suicide over and above depression, hopelessness, family functioning, BPD-symptoms, PTSD and childhood abuse[24,30,53,54,58]. Also, several studies have shown a significant positive correlation between frequency of NSSI and suicide attempts and lethality of suicide attempts[24,32,48].

Current research shows that individuals who engage in both NSSI and suicide attempts are a more troubled group than individuals with only NSSI or only suicide attempt, with more complex psychopathology and lower psychosocial functioning. Both adult and adolescent suicide attempters with NSSI feel more hopeless, lonely and angry, and engage in significantly more impulsive, risk taking behaviour and alcohol use than adolescent suicide attempters without NSSI-history[15,17,32,42,48]. In a recent longitudinal study of both DSH and NSSI, NSSI was associated with adverse social and mental health outcomes and individuals with DSH had even worse outcomes[17]. Thus, there seems to be a gradual increase in risk for adverse outcomes with self-harm that includes higher degrees of suicidal intent.

DSH and NSSI are important factors to consider in suicide risk assessment; still, the conditions under which they may increase risk for suicidal behaviours or other adverse outcomes are unclear. **Study I** sought to examine the role of NSSI in suicide attempters, to investigate whether co-occurring NSSI was associated with more severe suicidal behaviours, and to study its association with interpersonal violence.

2.1.6 Impulsive aggression

Impulsive aggression is the tendency to react with hostility, impulsivity and aggression to frustrating or stressful events[59]. Impulsive aggression is differentiated from proactive aggression which is defined as a more controlled, instrumental and predatory aggression[60]. Impulsive aggression has repeatedly been associated with attempted and completed suicide, and has been suggested as an endophenotype for suicidal behaviours[61], because it is associated with suicidal behaviours in the general population, has a heritability of 30-50%, is state independent, co-segregates within families and is associated with genes related to the serotonergic system[62].

Higher levels of self- or other reported aggression have quite consistently differentiated suicide attempters from non-attempters in both cross-sectional and longitudinal studies[63-65], and in a longitudinal follow-up study of a male high-risk population, early DSH was associated with impulsive aggression and interpersonal violence[66]. It has been suggested that suicidal behaviours – not ideation – are part of the inherited impulsive aggressive traits[67].

Both emotion dysregulation and impulsive aggression have been suggested to act as mediators of DSH or NSSI in individuals with personality disorders[68]. Specifically, it has been suggested that emotion dysregulation mediates NSSI in depressed individuals, whereas impulsive aggression mediates NSSI in non-depressed self-harming individuals[69].

There is preliminary evidence of an increased co-occurrence of interpersonal violence in individuals with NSSI. Elevated levels of self-reported aggression was associated with NSSI in a large sample of community adolescents[70] and was significantly associated with DSH in a longitudinal cohort study[26]. In a study of 122 community adolescents, the combination of both self-directed (criticism/self-doubt) and other-directed (criticism/aggression) hostility was

significantly related to NSSI, although rates of other-directed aggression were significantly higher among boys than girls[71]. Further, a cross sectional study of 2907 students, age 10-18 found a significant association between NSSI and self-reported verbal, indirect aggression and hostility in both boys and girls. They did not however, find any significant associations between physical aggression, anger and NSSI[72]. Also, in a cross-sectional mediational study of in-patient adolescents, there was a significant association between aggression and NSSI, a relationship that was partially mediated by self-reported lack of parental support and fully mediated by cognitive biases (negative self-talk and negative cognitive style)[40]. Finally, DSH is common among both male and female prisoners[73], and suicide risk has been found to be particularly high among female prisoners convicted of a violent crime[74].

Research on interpersonal violence in women is scarce, in part due to women committing fewer violent acts than men. However, some of the studies that do exist, suggest that violent women direct their violence towards intimate partners, friends and children to a higher extent than men[75], although other findings contradict that[76]. It is however clear that violent females have high psychiatric comorbidity, particularly within personality disorders such as antisocial personality disorder (ASPD) and BPD, but also with anxiety and mood disorders, self-harm and early conduct disorder[75,77]. Being victims of childhood abuse and intimate partner violence is more common among violent females than males[78-80]. Alcohol abuse is common among both male and female violence perpetrators, and may for women be particularly related to violence directed towards strangers[75,76].

Individuals struggling with self-harm and violent behaviours rarely tell their treatment providers about these behaviours due to stigma[81,82]. Thus, although relevant to the treatment and assessment of self-harming individuals there is a lack of knowledge on the association between deliberate self-harm and interpersonal violence informing clinicians on how to address these behaviours. Most studies assessing violence in self-harming individuals, have been conducted on small, clinical cohorts or forensic populations, using many different definitions of self-harm and violence. Thus the ability to draw any firm conclusions on the co-occurrence of violence and self-harm is limited. Further, as many studies are conducted within clinical cohorts and self-harming females are more prone to seek treatment for self-harm compared to males[83], studies may be biased. Against this background, **Study II** was conducted in order to study the association between previous clinical care due to self-harm and violent crimes, including possible gender differences in a population-based cohort study.

2.1.7 Self-harm as an emotion regulation strategy?

Several theories have proposed that deficits in emotion regulation skills and a heightened (or lessened) reactivity to negative emotions coupled with a reduced tolerance for high arousal explain the engagement in and maintenance of NSSI[84-86]. The experiential avoidance model (EAM;[85], see Figure 1), posits that NSSI is part of a response class of negatively reinforced behaviours (which may also include substance misuse, thought suppression or binge-eating

among others) and is maintained by the immediate relief from unwanted internal experiences[85]. Many studies have confirmed the association between negative emotional states preceding self-harm, particularly negative emotional experiences, such as anger, sadness, tension and fear, but also positive emotions as well as dissociative states and self-punishment[85,87,88]. Research suggests that individuals who engage in NSSI have more difficulties identifying, expressing and regulating emotions[34]. Some studies suggest that self-harming individuals also experience more negative affect and less positive affect, as well as more complex emotions that they have difficulties differentiating and identify[89] and instead use self-harm to reduce negative emotional states[87].

Dysfunctional emotion regulation plays a central role in the development and maintenance of self-harming behaviours[85,87] and has been defined as an impaired ability to flexibly and adaptively modulate the intensity and duration of emotional states and to control impulsive behaviours when distressed in order to facilitate engagement in non-mood dependent goal-directed activities[90]. Thus, effective emotion regulation involves the ability to identify and label emotions, to accept and monitor emotions, to appropriately evaluate the information from emotions and to inhibit impulsive behaviours. Emotion dysregulation indicates difficulties in all these areas, leading to impulsive and inappropriate behaviours and efforts to avoid or control emotions instead of controlling one's behaviours[85,90]. Although individuals who self-harm seem to have deficits in emotion regulation, both on a neurological level and a behavioural level, the evidence regarding trait emotional reactivity is mixed[91]. However, the EAM-model stipulates a poorer tolerance for aversive internal states. Thus, a general tendency to use avoidant coping strategies, in part due to emotion dysregulation and deficits in emotion regulation skills may predispose an individual to use NSSI to manage stressors.

Apart from the *intrapersonal*, emotion regulating function of NSSI, other models have also focused on the *interpersonal*, or social reinforcement of NSSI (i.e.,[23]), as self-harm can be a means of communicating with others, and/or making others lessen demands perceived to be too high[23].

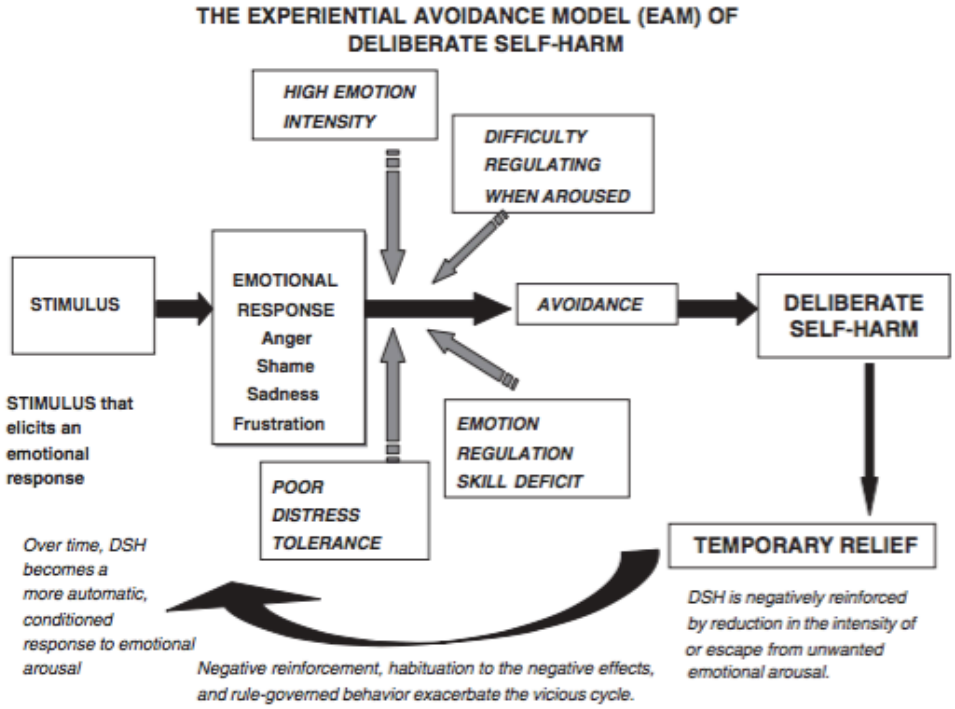


Figure 1. A model of the Experiential Avoidance Model of NSSI.

Thus, research suggests that DSH and NSSI are prevalent among both adults and adolescents and fills an emotion regulating function. Treatments targeting emotion dysregulation should be disseminated broadly in order to help self-harming individuals reduce NSSI.

2.1.8 Shared vulnerabilities and maintaining mechanisms

Why do impulsive aggression, violence and self-harm frequently co-occur? General patterns of emotion dysregulation have been found in individuals prone to both types of behaviours.

Individuals vulnerable to impulsive aggression and DSH tend to have an increased autonomic arousal and a low tolerance for aversive events, particularly related to perceived or actual interpersonal threat[60]. It has been suggested that the expression of aggressive acts toward others (e.g., intimate partners) may serve an emotion regulating function through the release of tension and unwanted internal experiences, in line with findings from experimental studies[90,92] and the EAM-model[85].

Regarding neurobiological correlates, serotonin dysfunction has been found in individuals with DSH as well as in individuals with impulsive aggression. Lower serotonin levels have been associated with aggression, depression and completed and attempted suicide, suggesting a common neurobiological link between aggression and suicidal behaviours[60]. In individuals with NSSI however, the association is unclear. A recent review concluded that serotonin deficiency was more related to aggressive and violent behaviours in general than to NSSI in

particular, although some evidence points toward that experimental reduction of serotonergic levels increased self-harm[93].

George and colleagues (2006) describe a link between interpersonal (domestic) violence and self-harm in a sample of 71 male and female perpetrators of domestic violence. In an interview-based study, they found that the perpetrators felt intense fear/rage, anxiety and a heightened autonomic arousal, accompanied by racing thoughts in situations that could lead to domestic abuse. George and colleagues hypothesized that aggressive acts mainly are conditioned fear responses (fight-or flight), where aggression typically happened when the perpetrators were unable to flee. Engagement in aggression was associated with an immediate relief, a relief that was not present when trying to cope with anxiety through fleeing the scene[94]. This description resembles to a high extent the EAM-model proposed by Chapman and colleagues, where self-harm is often engaged in to calm racing thoughts or to manage intolerable emotions the self-harming individual perceives he/she has no other way of managing[85,87]. Also, in an in-depth interview study on 13 women in forensic psychiatric care, participants described that self-harm and aggression were perceived to serve an emotion regulating function as a way of managing negative thoughts and feelings[95]. They perceived that violence and self-harm were both associated with a sense of relief and sometimes even happiness, and although they acknowledged that these strategies were destructive for them in the longer perspective, they felt they had no other means of regulating negative thoughts and emotions[95].

Thus, emotion dysregulation and emotional avoidance may be important factors in aggression towards others as well as when directed towards oneself.

2.2 TREATMENTS TARGETING DSH AND/OR NSSI

To date, no established pharmacological treatments specific to DSH or NSSI exist[3] and psychosocial treatments for DSH or NSSI have primarily focused on individuals with BPD, as DSH is included in the DSM-IV and DSM-5 as a criterion for BPD[14,33]. In Swedish outpatient psychiatry, mainly two treatments are offered patients with DSH or NSSI – dialectical behaviour therapy (DBT) and mentalization-based therapy (MBT). They have both shown effect on DSH in individuals with BPD[12,96,97], although a recent meta-analysis show that the effect size for DSH and BPD-related behaviours is small (Hedges $g = 0.32$; 95% CI, 0.09-0.54), and treatment gains are unstable during follow-up[98]. Also, these treatments are specialized for BPD and aimed at treating all aspects of BPD. Both treatments are long-term (lasting 1-2 years) and require highly skilled therapists, precluding these treatments from being offered on large scale to all psychiatric patients who self-harm. Consequently, patients who engage in self-harm are offered a multitude of different treatments within Swedish psychiatric care, such as supportive counselling, standard cognitive-behavioural therapy, and psychodynamic or existential therapy, none of which have been investigated empirically for DSH or NSSI.

There is a need to increase availability of treatments that directly target NSSI, and not only for individuals meeting full criteria for BPD. Thus, shorter, and more easily implementable treatments for NSSI need to be disseminated into routine clinical care. Against this background, **Study III** evaluated the implementation of a short, group-based behavioural treatment for NSSI into routine clinical care.

2.2.1 Emotion regulation group therapy

Emotion regulation group therapy (ERGT) was developed by Gratz and colleagues[99-101] in order to address the lack of shorter and more clinically feasible evidence-based treatments for DSH (i.e., NSSI) in individuals with BPD or subclinical BPD. It is based on an acceptance-based definition of emotion regulation, which involves a) emotional awareness, understanding and acceptance; b) the ability to control behaviours when experiencing negative emotions; c) the use of non-avoidant emotion regulation strategies to modulate the intensity and/or duration of emotional responses; and d) the willingness to experience negative emotions as part of pursuing meaningful activities in life[90].

ERGT is a behavioural group treatment that includes elements from cognitive behavioural therapy and DBT. It is a short-term (16 weeks, although post-assessment is conducted after 14 weeks) intervention delivered adjunctive to treatment as usual. ERGT targets NSSI directly through its proposed underlying mechanisms of emotion dysregulation and emotional avoidance[102] and has shown effects on NSSI and other self-destructive behaviours, BPD-symptoms, depression, anxiety, and emotion dysregulation[101]. However, ERGT has only been evaluated for adults treated in university settings in the United States, using expert therapists. Given the high prevalence of NSSI, it is important to evaluate novel treatments for NSSI that can be delivered by mental health professionals who work within the regular adult psychiatric care.

Thus, implementing and evaluating ERGT in routine clinical care could increase patient's availability to treatment for DSH and/or NSSI. **Study III** sought to evaluate the utility and feasibility of this ERGT when implemented in a Swedish psychiatric outpatient setting, involving 14 clinics around Sweden.

2.2.2 Predictors of treatment response

In introducing ERGT as a novel treatment in Sweden, it is important to identify prognostic factors (i.e. predictors) of treatment response and the patients most likely to benefit from the treatment[103]. The identification of predictors may help guide clinicians in recommending treatment interventions, and may also increase the overall rate of treatment responders as patients are better matched with treatment type. Also, it may be that the treatment needs to be adapted when delivered in a novel setting in order to enhance treatment effectiveness.

However, a limitation with studies on predictors is the lack of consistent findings. There is only one previous predictor study on ERGT, showing that higher levels of emotion dysregulation and baseline BPD-symptoms predicted greater improvements in BPD after treatment, and that higher levels of lifetime and 3-month NSSI predicted greater continued improvements in NSSI at post- and follow-up[104]. **Study IV** examined whether these results were generalizable when applied to ERGT in routine clinical care.

2.3 SUMMARY OF THE BACKGROUND OF THE THESIS

In conclusion, individuals with DSH or NSSI may represent a group with more impaired self-control, which in turn may constitute an increased risk factor for both interpersonal violence and attempted and completed suicide. Thus, targeting aggression and emotion dysregulation seems warranted when treating individuals with NSSI, however, research on treatment, predictors and long-term outcomes of DSH and its association with interpersonal violence is lacking.

3 AIMS

3.1 OVERALL AIM OF THE THESIS

The aim of this thesis was to study deliberate self-harm (DSH) and nonsuicidal self-injury (NSSI) in a broader context, by investigating the association between self-harm and violence towards others; and by evaluating the utility and feasibility of a novel treatment intervention with established efficacy for NSSI not previously validated in Sweden. The specific aims of the individual studies are presented below:

3.1.1 Study I

The aim of **Study I** was to compare suicidal severity and experience of interpersonal violence in a group of suicide attempters with and without a history of NSSI. The hypothesis was that suicide attempters who also exhibited a history of NSSI would have more serious suicidal behaviours and report higher levels of interpersonal violence.

3.1.2 Study II

Study II aimed to investigate whether findings of **Study I** could be replicated in a larger sample. In this study, a unique association between DSH and perpetration of violence towards others was examined in a longitudinal, population-based national cohort study.

3.1.3 Study III

The aim of **Study III** was to evaluate the utility of emotion regulation group therapy (ERGT), a short, group-based emotion regulation behavioural treatment for NSSI, when implemented in routine clinical care. In an open pilot trial design, we hypothesized that participation in this ERGT would be associated with significant improvements in NSSI, other impulsive and destructive behaviours and psychiatric symptoms, and that these improvements would be maintained at six-months follow-up.

3.1.4 Study IV

Study IV sought to examine what patient characteristics were associated with outcome (emotion dysregulation and NSSI) in ERGT as evaluated in **Study III**. Specifically, we aimed to study if predictors previously identified in efficacy studies of ERGT conducted in the US could be replicated in a Swedish community-based sample.

4 METHODS

4.1 DESIGNS, PRIMARY OUTCOMES AND ANALYSES

The papers in this thesis include several different methodologies and methods of analysis. The specific design, primary outcomes and main statistical analyses of the different studies are presented below:

4.1.1 Study I

Study I was a cross-sectional clinical study, and included 100 patients with and without co-occurring NSSI who had recently attempted suicide. The measures used were the Karolinska Suicide History interview (unpublished manuscript) assessing type and number of suicidal and non-suicidal acts; the Freeman Scale[105] assessing the reversibility and interruption probability of the suicide attempt; and the Karolinska Interpersonal Violence Scale (KIVS;[106]) assessing childhood and adult exposure to and expression of violent behaviour. Experienced psychologists and psychiatrists conducted all interviews. Analyses of non-parametric and parametric correlations were conducted using Spearman's *rho* and Pearson's *r*. A multiple linear regression was performed to predict lifetime violent behaviour from NSSI status.

4.1.2 Study II

Study II was a longitudinal, population-based register linkage study which included 1 850 525 individuals, all Swedish citizens born between January 1, 1982 and December 31, 1998 and living in Sweden at age 15. Exposure was defined as having received clinical care due to DSH as registered in the National Patient Register according to the ICD-9 or ICD-10 between 1994 and 2013, and outcome was defined as having been convicted of a violent crime, according to the Swedish penal law. The mean follow-up time was 8.1 years (SD = 4.7, range 0-17 years). Survival analyses of both gender specific and cohort-total risk and time-to-event were conducted through calculation of incidence rate ratios (IRR) and Cox proportional hazard rates (HR), with and without time-varying covariates and adjusted for familial clustering. As we sought to examine a shared predisposition to violence – whether it was directed toward oneself or against others, we also reversed all analyses, studying the association between individuals exposed to violent criminality and receiving clinical care due to DSH using the same methodologies as in the first set of analyses.

4.1.3 Study III

Study III was a multi-site uncontrolled open pilot study of emotion regulation group therapy (ERGT), a 16-week long behavioural treatment targeting NSSI and emotion dysregulation. Assessments were conducted at pre- and post treatment and at six-month follow-up, and included 95 women with threshold or sub-threshold BPD and NSSI. Primary outcome was self-reported frequency of NSSI assessed with the DSHI[13]. Within-group effects were investigated using multilevel generalized estimated equations negative binomial regressions and general linear mixed regression models.

4.1.4 Study IV

Study IV was a prediction analysis, based on data from **Study III**. Primary outcomes were frequency of NSSI assessed with the DSHI and emotion dysregulation assessed with the DERS[90]. Demographic, clinical and diagnostic predictors and their association to the outcome measures were analysed using multilevel generalized estimated equation negative binomial regression and general linear mixed regression models.

4.2 SAMPLE CHARACTERISTICS

This thesis encompasses three different samples. Although the samples differ with respect to how they were included in the studies, whether they sought treatment or not, what diagnoses they had, and for how long they were followed, all three samples share one common characteristic – they engaged in self-harm. The specific characteristics and clinical correlates of the three samples are described below:

4.2.1 Study I

Study I included 80 adult participants, 52 women (65%) and 28 men (35%), mean age 34.7 years (SD = 12.6, range 18-67). Participants were recruited between 2000 and 2005 after having attempted suicide, as part of their clinical follow-up at the Suicide Prevention Clinic, a specialized outpatient clinic for patients having attempted suicide, at the Karolinska University hospital in Stockholm. Of the 80 participants, 35 (44%) had engaged in NSSI, and that group was significantly younger and had more Axis II comorbidity, particularly BPD (*p*s < 0.001). The rate of substance use disorders and depression did not differ between the groups (*p*s > 0.6).

4.2.2 Study II

Study II included 1 850 525 individuals, 900 143 (49%) women and 950 382 (51%) men, with ages ranging between 15 and 32. Of all included individuals, 55 185 (3%) had been exposed to clinical care due to deliberate non-fatal self-harm (ICD-codes E950-9 or X60-84) or an event of undetermined intent (ICD-codes E980-9 or Y10-34). The exposed group had significantly higher psychiatric comorbidity than the unexposed group (all *p*s < 0.001), and had particularly high rates of BPD (42 times higher than in the unexposed group), substance use and anxiety disorders (8 times higher), and bipolar disorder (12 times higher).

4.2.3 Study III & IV

Study III and IV included 95 adult women with a mean age of 25.1 years (SD = 7.0, range 18-49). All participants were recruited by clinicians working at one of the 14 clinics included in the study. Participants were recruited either when seeking treatment at the clinic or from their regular treatment provider if they were already in treatment (that was not aimed specifically at treating self-harm) at the clinic. Of all the participants, 65 (68%) met full criteria for BPD whereas the remaining 30 participants (32%) met at least 3 criteria for BPD, including the criteria for suicidal or non-suicidal self-harm. Fifty-four participants (58%) had a history of suicidal behaviours (range 1-50), and 68 (72%) were taking psychotropic medication, and 80 participants (84%) had previously received psychosocial treatment at a mean length of 12.0 months (SD = 34.6). Also, comorbidity was high with 30-50% of the sample having co-occurring depression and anxiety disorders.

4.3 ETHICAL CONSIDERATIONS

The projects within this thesis include cross-sectional studies of clinical cohorts, registry-based studies, and treatment intervention studies – all related to patients who engage in potentially life-threatening behaviours. This is an important area of research, as self-harm is common in Sweden and a strong predictor for future suicide attempts. However, as these patients engage in high-risk behaviours, few treatment studies have been conducted on this patient population, thus increasing the importance of these projects as well as the manner in which they are conducted. In conducting research on self-harming individuals, considerations regarding patient safety are of great importance.

As **Study I** and **II** address sensitive information regarding co-occurring violence towards others, ethical considerations regarding stigmatizing an already vulnerable patient group must be made. In **Study I**, the assessment of interpersonal violence and NSSI was conducted within one month after an attempted suicide, thus requiring an especially considerate and respectful setting. Psychiatrists and psychologists experienced in working with suicidal individuals conducted all interviews, and all participants gave informed consent. Declining

participation in the study did not affect the clinical treatment of the patients at the Suicide Prevention Unit.

In **Study II**, ethical approval was already in place as the collection of data began. The Department of Medical Epidemiology and Biostatistics has a comprehensive control system to ensure patient safety. Sweden is known for its registry based studies and the ability to link individuals through their personal identity number, and Swedish citizens have limited possibilities to decline registration in registers and thus participation in research. It is therefore of importance to not be able to detect particular groups of individuals in the dataset. Although all registry data have been anonymized and linked to a personal code rather than the personal identity number, in working with such sensitive data, the importance of collecting only data relevant to the research question was emphasized.

There was close contact regarding patient safety and clinical care both in assessments around inclusion/exclusion as well as during treatment between the community clinicians, their directors and the research group in **Studies III** and **IV**. All participants gave informed consent and the study therapists informed all participants of their right to discontinue participation in research without this affecting their right to treatment, and what they may expect if they chose to participate in the research project. Further, screening, and assessment of severity of self-harm and suicidal ideation was thorough and – if the participant was included in the study – continuously monitored. This was done through a secure online website, where participants self-rated frequency of NSSI and suicidal urges each week. Therapists monitored participant's ratings and addressed those with the patients if needed. This ensured patient safety and enabled the research group to include individuals who would not otherwise have been offered treatment in a treatment study as few treatment studies include patients at risk for suicidal behaviours. However, the regular assessments may also have been burdensome for the participants. There was great effort on the researchers part to select well-known and validated assessment tools in order to reduce this burden while at the same time maximizing patient safety.

Further, in **Study III**, all sessions were filmed and reviewed weekly by the researchers, in order to assess the quality of the intervention given. This ensured some quality assurance for the participants, as well as enabled a more detailed supervision each week. However, this may also have had a negative impact on participants as patient integrity may have been affected. Special care was given to the security involved in uploading, reviewing and storing the filmed sessions. There is a continuous movement within the research field to increase and ensure research integrity, both in the conducting and reporting of clinical studies. Thus, **Study III** was registered in the ClinicalTrials.gov trial registry, and was reported in accordance with the TREND statement for non-randomised behavioural and public health interventions[107].

5 RESULTS

5.1 STUDY I

Non-suicidal self-injury and interpersonal violence in suicide attempters

Suicide attempters with a history of NSSI did engage in more severe suicidal behaviours and expressed more interpersonal violence than individuals only attempting suicide. Specifically, male suicide attempters with a history of NSSI had engaged in more violent suicide attempts ($p = 0.04$), and the more violent their attempted suicide was, the more NSSI they had engaged in ($p = 0.04$). Female suicide attempters with NSSI had engaged in more frequent suicide attempts than those without NSSI ($p = 0.02$). Also, suicide attempters with NSSI of both genders had used more interpersonal violence as adults compared to suicide attempters without NSSI ($p = 0.003$).

5.2 STUDY II

Association between deliberate self-harm and violent criminality

In **Study II** a unique and significant association between DSH and violent criminality was found, and that association was significantly higher for violent crimes than non-violent crimes. In the cohort-total analyses, individuals exposed to care due to self-harm had a 5 times higher crude hazard of being convicted of a violent crime than unexposed individuals. After controlling for relevant psychiatric comorbidity and socio-economic status the hazard remained significant and twice as high as for those not exposed to self-harm (HR 1.8, 95% CI 1.8-1.9). Also, when ensuring that the exposure to self-harm preceded the violent crime conviction in the time-varying covariates analysis, the results remained and were somewhat elevated (HR 2.2, 95% CI 2.1-2.2). The gender specific analyses revealed gender specific patterns of risk and exposure, see Figure 2. Self-harming women showed an almost 8 times higher crude HR of criminal conviction during the follow-up period, irrespective of the timing of the self-harm episode, whereas exposed men had a four times higher hazard than unexposed men. When adjusting the gender specific analyses for all relevant psychiatric comorbidity and socio-economic status in the final analysis, the HR remained doubled compared to unexposed women (HR 2.1, 95% CI 2.0-2.3 when not controlling for the timing of the self-harm; and HR 2.3, 95% CI 2.1-2.5 when the timing of self-harm preceded the violent crime conviction). The reversed set of analyses revealed results were very similar to those in the main analysis described above.

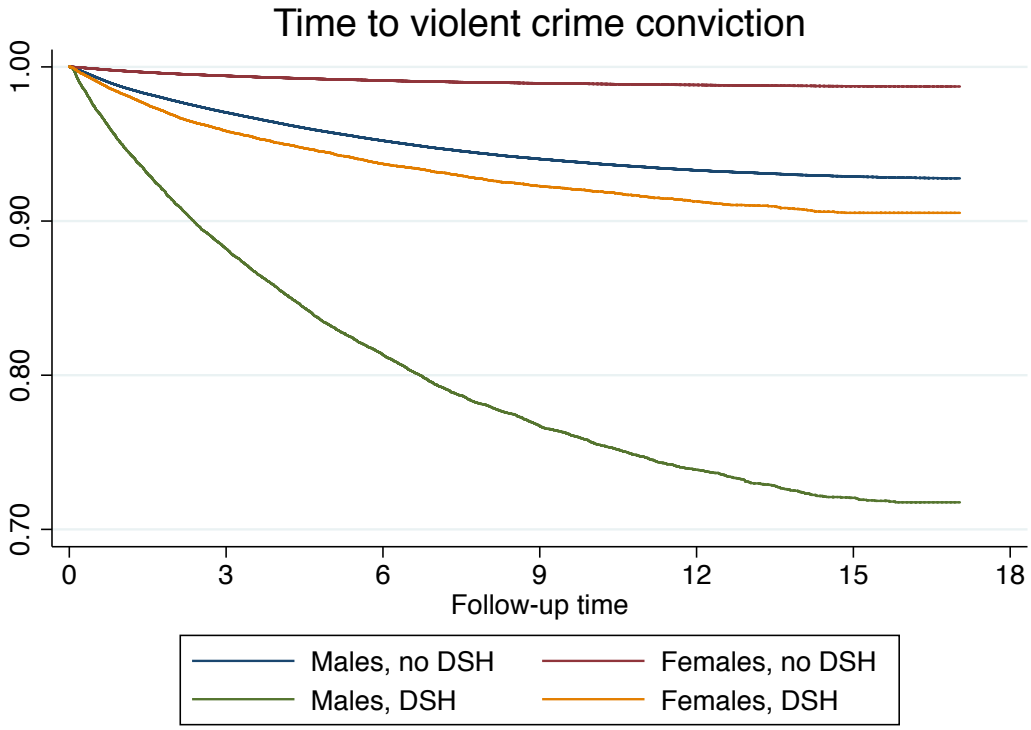
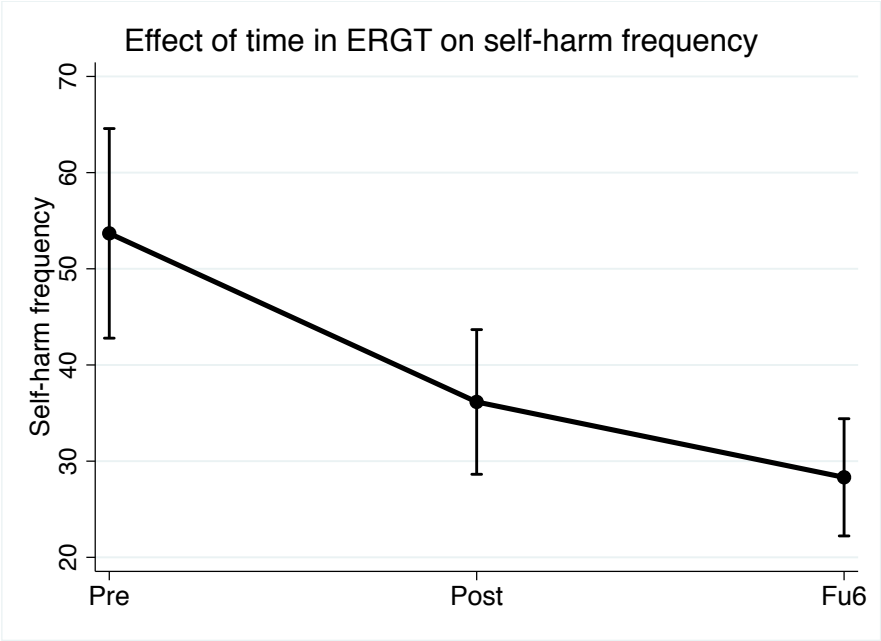


Figure 2. Kaplan-Meier survival curve displaying time to violent crime conviction for exposed and unexposed men and women in **Study II**. N = 1 787 425.

5.3 STUDY III

Emotion regulation group therapy for deliberate self-harm: A multi-site evaluation in routine care using an uncontrolled open trial design

Intent-to-treat analyses revealed that participation in ERGT was associated with a significant 52% decrease in NSSI at post-treatment, and a 76% decrease from pre-treatment to six-month follow-up, see Figure 3. Further, there were significant improvements in other self-destructive behaviours, emotion dysregulation, and psychiatric symptoms at post-treatment, associated with small to large effect sizes (Cohen's d = 0.30–0.91), and these gains were either maintained or further improved upon at six-month follow-up. Attrition was low, with 93% of the participants contributing with post-treatment assessments, and 82% contributing with six-month follow-up data.



Note. Pre = Pre treatment Post = Post treatment Fu6 = Six-month follow-up

Figure 3. Reductions in NSSI frequency during treatment and follow-up in **Study III**. N = 95.

5.4 STUDY IV

Predictors of improvement in an open trial multi-site evaluation of emotion regulation group therapy

Several demographic, clinical and diagnostic predictors of improvement in NSSI and emotion dysregulation were found when implementing ERGT in routine clinical care. Young age, more pre-treatment NSSI (during the six months before treatment start), higher BPD severity and higher rates of emotion dysregulation were associated with greater improvements in NSSI frequency during treatment or follow-up (all *p*s < 0.03). Higher emotion dysregulation and BPD severity was associated with greater improvement in emotion dysregulation during treatment and follow-up, respectively ($p = 0.01$ and $p = 0.005$). Co-occurring psychiatric disorders had a negative impact on patient's maintenance of progress, as depression, PTSD and SAD was associated with an increase in self-harm and emotion dysregulation during follow-up (all *p*s < 0.01).

6 DISCUSSION

Our findings suggest that both men and women who self-harm have an increased risk of being violent towards others, and that this risk is positively correlated with the severity or frequency of self-harm. Also, we found emotion regulation group therapy (ERGT) to be a useful and transportable treatment for self-harming individuals, although it may need some modification to help patients with comorbid disorders to maintain their gains. The findings are discussed below.

6.1 STUDY I

The findings from **Study I** adds to the literature on individuals engaging in both suicidal and non-suicidal self-injury (NSSI), and extended that knowledge to interpersonal violence as engagement in NSSI was significantly associated with the use of interpersonal violence as adults in both genders.

This study indicates a possible gender specific pattern to suicidal behaviours, as women engaging in both suicidal and non-suicidal self-harm behaviours had more often attempted suicide compared to those only engaging in suicidal behaviour, and men engaging in both behaviours had more violent suicidal behaviours and the more violent the suicide attempt was, the more frequently they had engaged in NSSI. However, we did not find any association between NSSI and severity of suicidal intent or reversibility, suggesting that this association may be due to an impaired self-control, and a higher degree of impulsivity among individuals with NSSI. Trait impulsivity has been associated with aggression, NSSI, difficulties in emotion regulation and suicidality[59,108] and the mediating role of impulsivity between NSSI, severe suicidal behaviour and interpersonal violence should be investigated in future studies. Also, suicide attempters with NSSI had a significantly higher rate of personality disorders, and may therefore represent a more severe patient group, thus confounding the association. The impact of personality disorders on suicidality is well established, with psychological autopsy studies suggesting that cluster B personality disorder in combination with impulsivity and aggression, differentiates those who died by suicide from those who did not[109-111]. However, when analysing the association with interpersonal violence in our sample, the multiple regression failed to find BPD to be significantly associated with interpersonal violence. As described above, BPD has been repeatedly associated with both suicidality and aggression, although a recent review questioned that, as they did not find BPD in the general population to be an independent predictor of violence[112]. However, this is an interesting finding in need of further investigation considering this was a clinically severe cohort.

6.1.1 Limitations and strengths of the study

The results may be biased due to selection, as many individuals were not eligible for participation, did not agree to participate in the study or were lost to follow-up, thus limiting the generalizability of the study. However, the strength of this study is the thorough diagnostic assessment, the clinical and suicidal severity of the sample, and the in-depth assessment of suicidal and non-suicidal self-harm.

6.1.2 Summary and future directions

Taken together, the findings suggest a gradual increase in both suicidality and aggression, with NSSI contributing to a significant difference in expressed violence towards others, and a possible gender specific pathway to more severe suicidal behaviours. Further research is needed with a larger sample to investigate the impact of gender differences and psychiatric comorbidities on interpersonal violence. Also, investigating the co-occurrence of interpersonal violence and self-harm in a non-clinical population may further clarify this tentative association.

6.2 STUDY II

We conducted a population based longitudinal cohort study and found a significant and unique association between interpersonal violence and deliberate self-harm (DSH). We found gender specific associations with violence, particularly related to substance abuse. As expected, individuals exposed to DSH had significantly higher rates of psychiatric comorbidity compared to the unexposed group.

6.2.1 Studying rare exposures and outcomes in registers

Swedish registers are of high quality and coverage[113,114]. The use of registry based studies are powerful in the ability to gather large amounts of data and to study rare exposures, particularly when combining several registers as in **Study II**. Validation studies of the National Patient Register suggest that diagnoses are reliable when validated in chart reviews[113,115-117]. However, the disadvantages of register-based studies are the lack of specificity and the low resolution of the data collected. Only individuals that have been assessed and/or treated by somatic or psychiatric care will have a diagnosis registered. This is not a true estimate of the prevalence or incidence of psychiatric disorders in the population, as many individuals with psychiatric disorders do not seek treatment, and some that seek treatment do not receive a diagnosis although it may be warranted. When it comes to DSH, which has been referred to as the “hidden disorder”, we know that very few of those who

self-harm seek treatment. An international study investigating self-harm in > 30 000 adolescents across Europe and Australia found the rate of treatment seeking to be as low as 12.4% among those with self-harm (8.9% of the girls and 2.6% of the boys)[118]. In our study, 3% of the cohort received clinical care due to self-harm during the follow-up period, a rate much lower than prevalence rates previously reported in community samples[18,45,119,120], but in line with the Madge et al. (2008) findings.

However, violent crime convictions are also rare outcomes, and most violent or aggressive acts (of a lesser severity than homicide) are never reported or prosecuted. This is particularly relevant as crimes related to interpersonal violence where perpetrator and victim know each other are unrecorded to a higher extent than crimes committed by strangers[121]. Thus, in this study, selection bias is affecting both the exposure and the outcome variable, but in ways unrelated to each other, therefore the estimates may be conservative, but the strength of their mutual association should be correct.

6.2.2 Is it reasonable to suggest we studied "NSSI" and interpersonal violence?

The simple answer is no (and yes). What we did study is DSH, in other words, both suicidal and non-suicidal self-harm. Previous Swedish registry based studies on intentional self-harm codes (E950-E959 and X60-X84) and events of undetermined intent (E980–E989 andY10-Y34) have analysed the data as attempted suicides, mainly including data from patients treated at inpatient clinics and hospitals. In this study, over 50% of our data came from outpatient clinics, which makes it reasonable to conclude that both NSSI and attempted suicides are included in this study (i.e., DSH). We believe that there is a qualitative difference to having an instance of DSH registered when seeing a psychiatrist at a specialized outpatient clinic, compared to having it registered at a somatic or psychiatric hospital or emergency department. We undertook several sensitivity analyses in order to analyse different degrees of lethality associated with self-harm, and found that higher degrees of lethality of the self-harm was associated with higher hazards of having a violent crime conviction (HR 4.3–10.2). Also, we did find a stronger association between violent crime and intentional self-harm codes compared to events of undetermined intent, suggesting that when clinicians register an intentional self-harm event, it is qualitatively different than when intent is unknown. Again, there seems to be a strong positive correlation between severity of DSH and violence. It may be hypothesized that our study also caught individuals engaging "only" in NSSI and their association with violent crimes. However, it is important to note that we only included the first record of DSH, so exposed individuals having a "low-lethality" DSH (i.e., potential NSSI) registered, may have self-harmed in a more severe manner during follow-up, without this information being included in the study. On the other hand, most exposed individuals only had one record of DSH during follow-up (median 1, mean 1.9, SD = 3.2, range 1–173).

Did we study interpersonal violence? Here, the answer is also complex. Regarding the sampling of crime convictions from the Crime register, it is important to note that a person may be convicted of several crimes at any one time. We selected the first registered offence for each individual. This implies that the association with a particular crime for a particular individual is unspecific, and does not provide much information on an individual level. Nevertheless, the most common offences in this population were crimes against liberty and peace and crimes involving public danger. We also conducted sensitivity analyses comparing the association between DSH and violent and non-violent crimes. In those analyses, an individual convicted of both types of crimes would serve as his or her own control, so to speak. Thus, on a population level, we did study crimes involving interpersonal violence, and we found a stronger association between violent crimes and DSH than non-violent crimes.

Taken together with other evidence of the interpersonal difficulties in both violent and self-harming individuals, and the established risk of interpersonal conflicts triggering both violent and self-harming acts[122], it is reasonable to suggest that there is an increased risk of interpersonal violence in self-harming individuals, and vice versa. The association is complex and involves interactions between social, behavioural and neurological factors, and future studies need to assess the specific conditions under which an individual engages in both types of behaviours.

6.2.3 DSH, violent crime and psychiatric comorbidities

Although we were able to establish a statistically significant association between DSH and violent crime, only 14.7% of the exposed individuals were convicted of a violent crime (n = 8 155). So what characterizes individuals exposed to self-harm that were also violent in our cohort? When analysing the distribution of psychiatric comorbidities across those convicted of a violent crime and those who were not, individuals with DSH and a violent crime conviction had a significantly higher rate of psychiatric comorbidity for all diagnoses except BPD, bipolar disorder, eating disorder and depression (see Table 1). Notably, ASPD, ADHD and substance use disorders was much more common among those convicted (ps < 0.001).

Table 1. Psychiatric comorbidities in self-harming individuals convicted of a violent crime compared to those not convicted of a violent crime.

Exposed to self-harm (N = 55 185)				
Psychiatric diagnosis	**Violent crime conviction n = 8 155**	**No violent crime conviction n = 47 030**	***X^2 df(1)***	***p***
BPD	727 (8.8%)	3 979 (8.5%)	1.144	*ns*
ASPD	213 (2.59%)	83 (0.18%)	762.950	< 0.001
SUD	5 023 (61.02%)	12 523 (26.67%)	3.8e+03	< 0.001
ADHD	2 411 (29.29%)	5 290 (11.12%)	1.9e+03	< 0.001
Psychotic disorders	746 (9.06%)	1 853 (3.95%)	408.435	< 0.001
Bipolar disorder	522 (6.34%)	2 928 (6.24%)	0.132	*ns*
Depression	2 688 (32.65%)	14 935 (31.81%)	2.299	*ns*
Anxiety disorders	3 917 (47.58%)	17 248 (36.73%)	348.607	< 0.001
Eating disorders	190 (2.31%)	2 983 (6.35%)	211.482	< 0.001
Autism	593 (7.20%)	2 061 (4.39%)	121.158	< 0.001

Note. BPD = Borderline personality disorder ASPD = Antisocial personality disorder SUD = Substance use disorders ADHD = Attention–Deficit Hyperactivity Disorder

This is in line with earlier findings that ASPD and substance use disorders are significantly associated with violence in community, forensic and psychiatric samples[35,123-125]. It has been found that specifically for women, comorbid ASPD and substance use disorders increase risk substantially for committing violent acts[79,126,127]. It has been suggested that women have a higher threshold to cross before using interpersonal violence, as social norms limit the display of violence in women to a higher extent than in men[128]. This would indicate that female violence perpetrators have a higher clinical (i.e., more severe psychiatric comorbidity) and trauma-related (i.e., higher degree of childhood sexual abuse, victims of domestic violence)

burden before becoming violent compared to male perpetrators[78,80]. However, as we did not control for the timing of the diagnoses in this study, we do not know if substance use disorders were diagnosed in association with the self-harm event, or at a later time point, thus representing a progression of clinical severity. However, it is clear that substance use had an effect on the association between DSH and violence in this cohort, which is in line with several studies on self- and other directed violence[42,124,126,127,129,130]. Studies on DSH from the UK have found that men are more likely to self-harm when intoxicated, which may explain the high percentage of exposed men in our study, perhaps receiving clinical care for DSH in association with intoxication. Lately, research has shown that this risk has increased for women during the past decade compared to earlier studies[46,131], and as previously noted, a recent study showed that alcohol use has risen as a self-reported problem among adults presenting at emergency departments due to DSH[44]. Thus, substance use is an increasing problem among individuals with DSH, and seems to increase risk for violence towards others. This association needs to be further explored, and assessment of and interventions for both aspects of violence and substance use disorders need to be developed.

Impulsivity – in the form of ADHD – was more common among exposed individuals convicted of a violent crime. ADHD has repeatedly been associated with violence[132], substance abuse[133] and DSH[134]. It is also a part of the "impulsive aggressive"-traits studied in the co-occurrence of self-harm and violence and suggested to be a trait connecting these behaviours[59]. Although as impulsivity is a difficult term to define, findings are inconclusive as of yet[63]. However, it is not surprising that this diagnosis is more common among our convicted and exposed individuals.

6.2.4 Shared vulnerabilities and maintaining mechanisms revisited

What drives interpersonal violence? The George et al (2006) study makes for an interesting hypothesis in linking aggressive behaviours to fear conditioning and avoidance, and describing a pathway to violence through a heightened sensitivity to environmental stimuli, similar to Linehan's biosocial theory[12] and the EAM[85]. The perpetrators admitted to either striking their significant other, the wall or cutting themselves, as an attempt to relieve anxiety and racing thoughts. Alcohol and drugs helped them relax but also increased the speed with which aggression occurred, and increased the likelihood of reacting with fight, rather than flight. They also displayed affective instability, rapidly shifting moods and had psychiatric disorders within anxiety disorders and personality disorders[94]. Thus, there is a high degree of similarities in individuals engaging in domestic violence and in self-harm, particularly when comorbid with BPD. It is unclear though, how generalizable these findings are to individuals convicted of violent crimes. Violence is – just as self-harm – a heterogeneous concept with many levels of severity, making it difficult to assume that all individuals who are violent are driven by the same mechanisms. On the contrary, different classifications are made within this field, for instance between reactive (i.e., impulsive aggression) and proactive (i.e., predatory aggression more associated with psychopathic traits) aggression[60]. However,

emotion regulation difficulties in violent individuals should be further explored, particularly since the characteristics of individuals engaging in violent and self-harm behaviour may be more similar across genders than previously thought.

6.2.5 Limitations and strengths of the study

As previously noted, the limitations of this study are the low resolution of the variables studied, and the potential risk of misclassification and underreporting of DSH in the registries. However, the strengths are the large sample size, the stringent definition of both the exposure and outcome (uncommon in studies of both DSH and violence, where – as previously noted – a multitude of definitions exist), and the possibility to study gender differences. Another strength is that the population in **Study II** was "non-clinical", in the sense that those exposed were not selected from a clinical setting (although it is important to note that we do not know if or how much treatment any of them had received).

6.2.6 Summary and future directions

It is reasonable to conclude that self-harm is associated with aggression. This adds to the previous literature on the association between suicide and aggression and extends it to DSH and NSSI, although we still do not know why or when they co-occur. The findings suggest that self-harm behaviours may be best conceptualized on a continuum, and that different levels of risk factors or clinical burden are associated with a higher suicidal – and violent – severity. Several such risk factors have been identified, either as distal or proximal risk factors. Childhood maltreatment and abuse is such an established distal risk factor for both violence and self-harm[37,135,136]. Psychiatric comorbidity is another risk factor, which seem to be as prevalent in DSH and NSSI as in suicide completers[35], although not enough in itself, as the majority of individuals with psychiatric disorders neither self-harm nor commit violent acts. Other risk factors are substance abuse as described above, and personality disorders, which contributes to a higher risk, as they are indicative of higher psychiatric burden. Also, personality traits such as impulsivity, aggression and emotion regulation difficulties may have unique contributions to the co-occurrence of these behaviours. Further research is needed to disentangle this interaction, preferably in a path-analysis where their competing effect may be investigated.

6.3 STUDY III AND IV

Study III was an intervention study, using an open pilot, uncontrolled design, aiming to study the feasibility and acceptability of a group-based, adjunctive treatment for NSSI. We

found significant reductions in NSSI, emotion dysregulation and psychiatric symptoms, and these results were maintained or further improved upon at six-month follow-up.

As this was an uncontrolled study, there are some inherent difficulties in interpreting the findings. The lack of a control group essentially precludes drawing conclusions about the treatment's effectiveness, although many factors suggest that ERGT in routine clinical care is a useful treatment for NSSI.

First, it is possible but unlikely that a 52% reduction in frequency of NSSI would occur spontaneously in the course of 14 weeks, as found at post-treatment. Our findings are strikingly comparable to previous ERGT studies, and when comparing the waitlist controls in the two randomized controlled trials of ERGT that have been conducted, they showed a 50% increase in NSSI at post-treatment in the first study[99], and a 5% reduction in the second study[101]. This comparison makes it likely that participation in ERGT may have contributed to this reduction, however we cannot know for sure. Second, there was a significant and continued reduction in NSSI during follow-up, which one could hypothesize was due to a continued use and efficiency of the emotion regulation strategies learned during treatment. Further, a high percentage of participants contributed with post-treatment and six-month follow-up assessments (93% and 82% respectively), thus including data from participants who dropped out of treatment. However, future studies need to evaluate ERGT in routine clinical care in a randomized controlled design to control for effects of time, attention and other non-specific effects of being in a treatment intervention study.

6.3.1 Aggression in the ERGT-study

We did not assess the use of interpersonal violence in **Study III**. Conducting complementary analyses where aggression was measured with a composite variable consisting of criteria no 8 in SCID-II; *Inappropriate, intense anger or difficulty controlling anger (e.g., frequent displays of temper, constant anger, recurrent physical fights*)[137], criteria no 9 in Borderline Symptom List; *during the past week I had uncontrollable angry outbursts or attacked others physically [at least 2-3 times]*[138] and criteria no 10 from Inventory of Interpersonal Problems – BPD; *I am too aggressive towards others*[139]. The composite variable ranged from 1–3 and showed a significant association with BPD-severity ($b = 0.88$, SE = 0.24, $p < 0.001$, see Figure 4).

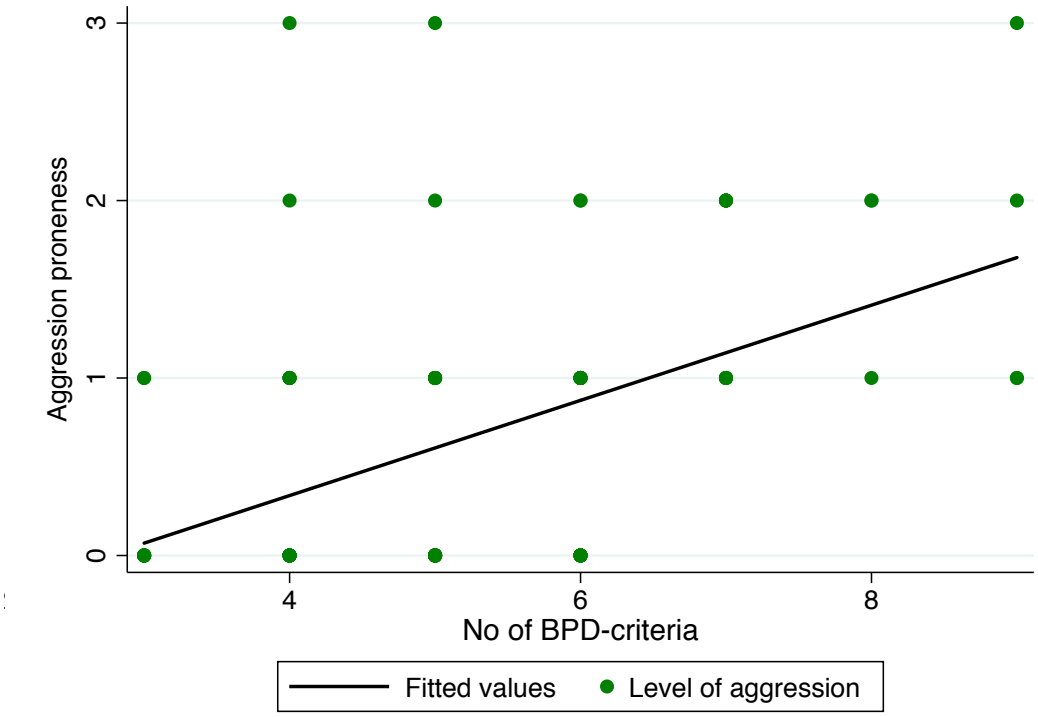


Figure 4. Association between levels of aggression and number of borderline personality disorder (BPD) criteria in participants from **Study III. N = 95**

However, as previously noted, it is difficult to draw any conclusions from this, as this was not formally assessed with a structured assessment enabling us to compare our sample with others. However, this may add to findings of BPD being associated with aggression in more clinically severe cohorts and needs to be further investigated.

6.3.2 Clinical value of the implementation and evaluation

There are several important clinical findings and strengths in an effectiveness study such as **Study III**, and one of those is the external validity. Twenty-eight community clinicians of different professional backgrounds delivered the ERGT after receiving a three-day training in ERGT. Also, patients were recruited at their local clinics and received ERGT as part of their standard treatment. And although the sample may to some extent have been a convenience sample, as probably not all participants eligible for study inclusion were assessed, the included participants seemed – from a clinical perspective – to be representative of self-harming and treatment seeking patients with BPD or sub threshold BPD within Swedish outpatient psychiatric care.

The ERGT evaluation and implementation in routine clinical care offered several other important advantages in the treatment and assessment of individuals with NSSI. First, clinicians were taught how to assess and monitor multiple forms of NSSI with structured measures. This is important as a national survey assessing NSSI in 1717 patients at 84 Swedish adolescent and adult outpatient clinics showed that one third of the individuals who self-harmed did not tell their treating clinician about this[140]. Second, the baseline assessment of eligibility included structured assessment of patient's psychiatric comorbidity before treatment start, and a thorough suicidal anamnesis and risk assessment. Third, helping the clinicians conduct research in their own clinical setting was often challenging as their workload was increased, but it also raised their awareness of how collecting structured data can generate knowledge, and inform treatment interventions. For instance, therapists were able to track participants' NSSI frequency through the internet-based weekly assessments, thus enabling them to monitor each participant's progress or lack thereof. Fourth, this study increased access to treatment for self-harming individuals. Having a treatment that targets NSSI available at one's clinic may increase the "non-ERGT" clinician's likelihood to ask about self-harm, as research shows that clinicians often feel frustrated or hopeless and do not know how to help self-harming patients[141]. Finally, we do hope that participants experienced ERGT to be helpful. We know that some participants felt that the treatment was stressful, due to it being delivered in a group setting, whereas others felt that that was its greatest strength – meeting others struggling with NSSI made them feel validated and "normal". And although it was scary to talk about emotions in group, it was perceived as helpful. Interestingly, participants rated treatment credibility and expectancy of improvement[142] after session one lower than in previous ERGT studies (mean credibility 5.7, and expectancy 47%, compared to mean credibility 6.9 and expectancy 59% in[100]), although dropout rates were similar (22%)[99-101]. This may have been due to the fact that our therapists were to a lesser extent "experts" in ERGT, but also that the treatment was given within their regular psychiatric clinic.

The transportability and brevity of ERGT and the relative ease with which it was implemented into routine clinical care, as well as the promising results on NSSI makes us conclude that increasing the availability of ERGT will benefit self-harming patients. The research group has continued to train new clinicians in ERGT (120 therapists and 12 supervisors) since the first ERGT workshop in 2013. We have also authored guidelines on how to best implement ERGT into one's clinic, so as to ensure safe and qualitative delivery of the treatment.

Finally, the prediction analysis (**Study IV**) indicated that ERGT might also be suitable for individuals with more severe difficulties in emotion dysregulation and NSSI, thus extending the knowledge on its eventual usefulness in routine clinical care. However, robust predictors are difficult to find across studies, as studies seldom are designed to investigate predictors but outcomes. In an attempt to strengthen the theoretical basis for **Study IV**, we chose to investigate previously identified predictors of treatment response in ERGT, but were only able to replicate some of the earlier findings, such as NSSI frequency and BPD-severity[104] as

significant predictors. However, this was also due to the fact that several measures used in the Gratz et al (2014) study were not included in our study.

6.3.3 Limitations and strengths of the studies

There are several limitations to **Study III** and **IV**. As previously noted, the lack of a control group limits our ability to draw any firm conclusions of the effect of ERGT in our sample. Also, as described above, there is also a risk of selection bias in the recruitment of participants to the study, as individuals with more severe psychopathology may not have been asked to participate in the study. We did not conduct thorough assessment of personality disorders and used the MINI-screen interview at the initial assessment. This may have inflated rates of axis I diagnoses which would be relevant to, and possibly bias the findings in **Study IV**. Finally, we only included women, which limits generalizability of the study results. Future studies need to investigate the usefulness of ERGT for males with DSH.

6.3.4 Summary and future directions

From a clinical perspective, ERGT fills an important treatment gap in psychiatry. It is a short, clinically feasible treatment that can be combined with any version of treatment as usual, and it targets NSSI specifically through the teaching of more effective emotion regulation strategies. Such treatment has been lacking, and as NSSI (and DSH) seem to become more prevalent, it is more important than ever to increase access to treatment. More research is needed, and perhaps some modifications would increase its usefulness further, specifically for patients with aggressive or violent behaviours.

7 CONCLUSIONS AND FUTURE DIRECTIONS

The findings from the studies included in this thesis suggest that there is an association between self-harm and violence towards others. Assessments and treatment interventions need to target both these behaviours, possibly through treatments focusing on increasing emotion regulation skills. Emotion regulation group therapy is a promising and transportable treatment for NSSI and could fill a treatment gap for individuals struggling with NSSI.

Future studies need to examine the specific pathways to co-occurring violence and self-harm, as risk factors such as higher psychiatric complexity, higher levels of self-reported aggression and childhood abuse are important but not unique contributors to both behaviours. An interesting topic for future studies could be to investigate whether difficulties in emotion regulation are relevant in violent and aggressive individuals, and if treatment targeting emotion regulation could be helpful for them.

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