Nonsuicidal Self-Injury-Relief Associations Over the Course of Dialectical Behaviour Therapy

by

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Abstract

I examined the relationship between the strength of a cognitive nonsuicidal self-injury (NSSI)-relief association and NSSI over time in the context of dialectical behaviour therapy (DBT) among individuals with borderline personality disorder (BPD). Self-injuring individuals with BPD were assessed for BPD and NSSI and randomly assigned to 6 or 12 months of comprehensive, standard DBT. Participants were re-assessed for NSSI every 3 months from the start of therapy for 24 months. The NSSI-relief association was assessed at baseline and again at 6 and 12 months after the start of therapy via the deliberate self-harm implicit association test (DSH IAT; Gratz et al., 2016). At baseline, participants also completed a measure of their motives for NSSI. Hypothesis 1 was that, at baseline, lifetime NSSI would be positively associated with the NSSI-relief association beyond self-reported emotion relief motives. Hypothesis 2 was that the NSSI-relief association would weaken over the course of one year after treatment began. Hypothesis 3 was that the NSSI-relief association at baseline would predict the rate of change of NSSI from baseline to the end of one year, such that a stronger NSSI-relief association would predict a slower rate. Hypothesis 3a was that the rate of change of NSSI from baseline to the end of one year would predict the rate of change of the NSSI-relief association from baseline to the end of one year, such that a greater rate of change of NSSI would predict a greater rate of change of the NSSI-relief association. Analyses revealed that lifetime NSSI was not associated with the NSSI-relief association beyond self-reported emotion relief motives. As well, the NSSI-relief association did not weaken over the course of one year. Finally, findings from parallel linear growth curve models did not support hypothesis 3 or 3a. These results suggest that the DSH IAT might not be sensitive to treatment effects in DBT for individuals with BPD in clinical populations. Findings also suggest that future research should investigate change in other processes that maintain NSSI, the association between DSH IAT D scores and NSSI consequences, and the relationship between NSSI and relief over time.

Keywords: borderline personality disorder; nonsuicidal self-injury; implicit association test; dialectical behaviour therapy

Dedication

This is for Lin. I love you.

Acknowledgements

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Chapter 1.

Introduction

With a prevalence between 1.1% – 6% in the general population (Grant et al., 2008; ten Have et al., 2016; Tomko et al., 2014) and even higher among psychiatric inpatients (approximately 15%; Tomko et al., 2014; Widiger & Francis, 1989), borderline personality disorder (BPD) is a heavy burden to those afflicted with the disorder and to the mental health system. Importantly, there is a high prevalence of self-destructive behaviours, especially suicidal and nonsuicidal self-injury (NSSI), among individuals with BPD (63% – 75%; American Psychiatric Association [APA], 2013; Black et al., 2004; Gunderson, 2009; Soloff et al., 1994). Recently, a novel implicit measure was developed to measure the strength of a cognitive NSSI-relief association theorized to maintain NSSI: The deliberate self-harm implicit association test (DSH IAT; Gratz et al., 2016). The DSH IAT may have utility in tracking change in NSSI risk over time. The primary aim of this research was to add to the existing literature on the role of emotional relief in NSSI among individuals with BPD and to test the utility of the DSH IAT in tracking change in NSSI risk in the context of treatment.

Chapter 2.

Background

2.1. Borderline Personality Disorder

BPD is a severe disorder characterized by symptoms that fall broadly into four domains: Impulsivity, emotion instability, identity disturbance, and interpersonal instability (APA, 2013). Linehan's (1993) biosocial model originally posited that BPD develops because of a transaction between a biological predisposition to emotional vulnerability and an invalidating childhood environment (Linehan, 1993). Emotional vulnerability is characterized by high sensitivity to emotional cues, intense emotional reactions, and a slow to return to emotional baseline (Linehan, 1993). The invalidating environment is one wherein caregivers indiscriminately reject the child's communication of emotional experiences, oversimplify the ease of problem solving and coping, and intermittently reinforce extreme emotional expression (Linehan, 1993). In these environments, emotionally vulnerable individuals learn that their emotions are to be avoided or suppressed and frequently experience emotions as overwhelming, aversive, or painful (Linehan, 1993). Individuals at risk for BPD also fail to learn adaptive ways to regulate their emotions and often turn to maladaptive behaviours (e.g., substance use, NSSI) for emotional relief (Linehan, 1993). As well, the intermittent reinforcement of their extreme emotional expression leads to the escalation of these behaviours when seeking attention and support (Linehan, 1993).

In the almost thirty years since Linehan proposed the biosocial theory, a growing body of research has supported and expanded the model (Crowell et al., 2009; Crowell et al., 2014). Importantly, trait impulsivity (i.e., poor impulse control) has emerged as another potential biologically based precursor to BPD (Crowell et al. 2009; Crowell et al., 2014). Trait impulsivity, which is highly heritable, combined with a child's emotional sensitivity and negative affectivity, contributes to a tendency towards impulsive emotional and behavioural expression (Crowell et al., 2009; Crowell et al., 2014). Further, when the caregivers of at-risk children are ill-equipped to validate emotions and to model appropriate expressions of emotion, a pattern of reciprocal escalation of emotional expression often emerges in conflict situations (Crowell et al., 2009; Crowell et

al., 2014). This pattern of escalation negatively reinforces emotional expressions of increasing intensity and thus vulnerable children become increasingly emotionally dysregulated (i.e., react very easily to emotional cues, have intense emotional reactions, and demonstrate a slow to return to emotional baseline; Crowell et al., 2009; Crowell et al., 2014). As a result, these individuals often find their own emotions overwhelming and intolerable and turn to maladaptive behaviours (e.g., substance abuse) for emotional relief, often compounding interpersonal dysfunction and impeding the development of more adaptive coping (Crowell et al., 2009; Crowell et al., 2014). In this context, NSSI and suicidal behaviour often emerge in early adolescence as forms of maladaptive emotion regulation (Chapman, 2019; Crowell et al., 2009; Crowell et al., 2014). Thus, a developmental trajectory can be charted for BPD, starting with heritable biological vulnerabilities interacting with aspects of the developmental environment to increase emotion dysregulation and maladaptive behaviours, especially NSSI, in adolescence and ultimately to BPD in early adulthood (Chapman, 2019; Crowell et al., 2014).

2.2. BPD and NSSI

A significant contributor to the emotional suffering experienced by individuals with BPD is the high prevalence of impulsive, maladaptive behaviours engaged in by those afflicted with the disorder (APA, 2013). For example, comorbidity rates between substance abuse and BPD range from 14% to 72% (Sansone & Sansone, 2011). BPD also has a high prevalence among individuals who gamble pathologically (16%; Fernández-Montalvo & Echeburúa, 2004). As well, BPD is significantly associated with past year risky sexual behaviour, beyond substance abuse (Tull et al., 2011). Further, BPD is one of the most common personality disorders among individuals with bulimia and binge eating disorder (Cassin & von Ranson, 2005).

Particularly troubling, and of central relevance to the current study, is the high prevalence of suicidal behaviour and NSSI among individuals with BPD. NSSI is the purposeful, direct damaging of one's own body tissue with no intent to commit suicide (excluding socially sanctioned reasons, such as piercing or tattooing; Herpertz, 1995; Chapman et al., 2006; Gratz, 2001; Muehlenkamp, 2005). Estimates of the prevalence of NSSI among individuals with BPD range from 63% to 75% (Gunderson, 2009; Soloff et al., 1994). As well, approximately 75% of individuals with BPD report past suicide

attempts and the suicide-related mortality rate for those with BPD has been estimated to be approximately 10% (Black et al., 2004; Gunderson, 2009).

Though the high prevalence of suicide attempts and suicide-related deaths among individuals with BPD is concerning, this study focussed specifically on NSSI in BPD. A history of NSSI doubles the likelihood of suicide (Stone et al., 1987), and a high percentage of individuals who engage in NSSI report at least one past suicide attempt (30% in community; 70% among inpatients; Muehlenkamp & Gutierrez, 2007; Nock et al., 2006). Theory suggest that NSSI increases risk for suicide by increasing the individual's capability for suicide (via habituation to pain and fear; Joiner, 2005). Supporting this postulate, Klonsky and May (2015) found that factors (such as NSSI) that increase an individual's capacity to handle the pain and fear associated with attempting suicide increase an individual's risk for moving from suicide ideation to action. As such, gaining a greater understanding of factors that contribute to the maintenance of NSSI and how they change over the course of treatment is important in part due to the association of this behaviour with suicide. Further, outside of its association with suicide, NSSI has long-term negative emotional consequences (e.g., chronic guilt and shame; Briere & Gil, 1998), strains interpersonal relationships, and has negative medical consequences (e.g., complications such as infection; Wilkinson & Goodyer, 2011).

2.3. Theory of NSSI

According to behavioural theory, behaviours are strengthened and maintained by their consequences (a phenomenon known as reinforcement). Theory suggests that NSSI is maintained via negative reinforcement, whereby a behaviour functions to remove an aversive antecedent stimulus. For example, eating functions to remove unpleasant hunger pangs; thus, a person is more likely to eat when they experience hunger. When an emotionally dysregulated individual turns to NSSI and experiences immediate relief from aversive, overwhelming emotions, this behaviour is negatively reinforced and, consequently, more likely to reoccur (Chapman & Dixon-Gordon, 2007; Chapman et al., 2006; Haines et al., 1995; Nock & Prinstein, 2004; Linehan, 1993). For the current research, I proposed that the reinforcement of NSSI by relief leads to the formation and strengthening of a cognitive NSSI-relief association (consistent with Gratz et al., 2016). The more NSSI reoccurs and is negatively reinforced, the stronger the

NSSI-relief association becomes, and the more likely an individual is to turn to the behaviour for relief.

2.4.   Measurement of and Research on Motives for NSSI

Decades of research on the motives for NSSI have found that individuals engage in NSSI for many reasons (e.g., self-punishment, interpersonal communication, sensation seeking, to express anger, etc.; Brown et al., 2002; Kleindienst et al., 2008; Klonsky, 2007; Lloyd-Richardson et al., 2007). One of the most commonly reported reasons for engaging in NSSI, however, is to get relief from unwanted, aversive emotional states (Klonsky, 2007; Gratz, 2003). This finding is consistent in research with adult and adolescent participants and across community and clinical samples (Brown et al., 2002; Kemperman et al., 1997; Kleindienst et al., 2008; Klonsky, 2007; Laye-Gindhu & Schonert-Reichl, 2005; Young et al., 2007). Importantly, research has demonstrated that individuals with BPD are significantly more likely to report that they experience relief after they engage in NSSI than individuals who engage in NSSI who do not have BPD (Chapman & Dixon-Gordon, 2007). The frequent engagement in NSSI among individuals with BPD and the higher prevalence of its reinforcing consequences (the relief after engaging in NSSI) suggests that the implicit NSSI-relief association is likely heightened among those with BPD.

Much of the research on NSSI has relied on self-report questionnaires to investigate motives for NSSI or post-NSSI experiences, though some studies have attempted to use NSSI proxies (imaginal or otherwise) to investigate the effects of NSSI on emotional arousal in the lab (Klonsky, 2007). For example, Reitz et al. (2015) made a 4-mm incision with a scalpel on the arms of participants with BPD (with current NSSI) and healthy controls following a stress induction. Results indicated that, in the BPD group, the incision (versus a sham incision) led to greater reductions in self-reported aversive tension. As well, in the BPD group, functional magnetic resonance imaging showed reductions in brain activity in the amygdala following the incision (consistent with the downregulation of emotions), supporting participants' self-reports of decreased aversive tension (Reitz et al., 2015). Other laboratory studies have found similar reductions in self-reported and physiological measures of negative affect and arousal following NSSI proxies (Brain et al., 1998; Haines et al., 1995; Russ et al., 1992).

2.5. The Utility of Implicit Measures

While these self-report and laboratory studies lend support to theories proposing that NSSI is maintained by its emotion relieving consequences, they do not implicitly measure the cognitive NSSI-relief association. Focusing on implicitly measured associations might be important for a couple of key reasons. First, implicit measures are less subject to errors in memory, impression management motives, or reporting biases that threaten the validity of explicit, self-report measures (e.g., over- or underreporting on self-report measures). Second, while laboratory studies are also likely safe from these threats to validity and have demonstrated the immediate emotion relieving consequences of NSSI, implicit measures might capture overlooked cognitive processes that maintain NSSI risk over time.

2.6. The Implicit Association Test

One way in which researchers have attempted to measure cognitive processes is via the implicit association test (IAT; Greenwald et al., 1998). Originally developed to investigate implicit attitudes regarding race, the IAT is a computerized, timed sorting task that uses reaction time as a measure of the strength of the cognitive associations between target pictures or words and single-word attributes (the faster the reaction time the stronger the association; Greenwald et al., 1998).[1] The IAT has been demonstrated to detect expected associations between pictures and congruent attributes versus incongruent attributes, such as between flower pictures and flower words versus insect words (Greenwald et al., 1998) or spider pictures and danger words versus safety words among individuals with spider phobias (Teachman & Woody, 2003).

2.7. Implicit Measurement of the NSSI-Relief Association in the Context of Treatment

Of particular relevance to my research, the IAT also has demonstrated clinical utility as an indicator of risk for suicide and as a measure of treatment effects. For example, the IAT designed to implicitly measure spider-fear associations among individuals with spider phobias predicted avoidance behaviours (Teachman & Woody,

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[1] See Methods section for details.

2003). Further, patients demonstrated significant reductions in spider-fear associations post-treatment (Teachman & Woody, 2003). As well, IATs designed to measure cognitive associations relevant to social anxiety (the Self-Anxiety IAT; Gamer, Schmukle, Luka-Krausgrill, & Egloff, 2008) and violence (the Weapons-Entertainment IAT; Polaschek, Bell, Calvert, & Takarangi, 2010) have demonstrated similar reductions in cognitive associations following treatment with gold-standard therapies for each.

Importantly, the IAT has also demonstrated utility in measuring cognitive associations relevant to self-directed violence. The Life-Death IAT (Nock et al., 2010), for example, used target words pertaining to "life" (e.g., alive, survive) and "death" (e.g., dead, lifeless) and attributes relating to "me" (e.g., I, myself) or "not me" (e.g., they, other) to measure cognitive associations between the self and death (versus life). Nock et al., 2010 found that not only did their Life-Death IAT find stronger implicit death-self associations among psychiatrically distressed individuals who had attempted suicide (versus psychiatrically distressed individuals who had not), but that the strength of the implicit associations predicted future suicide attempts beyond other known risk factors (e.g., depression) and clinician and patient predictions. The Life-Death IAT has also demonstrated predictive validity for suicide among adolescents (Nock & Banaji, 2007) and for NSSI (Randall et al., 2013). Further, findings have indicated that the life-self association on the Life-Death IAT was strengthened over the course of treatment and predicted suicide ideation at discharge for psychiatric inpatients (Ellis et al., 2016).

Chapter 3.

The Current Study

Recently, a novel test was developed to implicitly measure the NSSI-relief association among individuals who engage in NSSI, the deliberate self-harm implicit association test (DSH IAT; Gratz et al., 2016). The DSH IAT uses differential reaction times to NSSI-relief stimuli pairings and NSSI-disgust stimuli pairings during the task as proxies for the strength of the NSSI-relief association (relative to disgust; Gratz et al., 2016).[2] When scored, the DSH IAT returns for each participant a single D score, which is indicative of the strength of the implicit association of NSSI with relief relative to disgust (Gratz et al., 2016). Higher D scores indicate a stronger NSSI-relief association relative to disgust (Gratz et al., 2016). As expected, Gratz et al. (2016) found stronger NSSI-relief associations (relative to disgust) among individuals who engaged in NSSI versus individuals who did not.

Of particular relevance to my research, Gratz et al. (2016) also found that individuals who engaged in NSSI and had BPD demonstrated stronger NSSI-relief associations (relative to disgust, i.e., higher D scores) than individuals who engaged in NSSI who did not have BPD. This finding is consistent with studies showing that individuals with BPD (versus healthy controls) are significantly more likely to report experiencing relief following NSSI (e.g., Chapman & Dixon-Gordon, 2007) as well as the aforementioned research showing an emotion regulation effect of a laboratory NSSI analogue among self-injuring individuals with BPD but not controls (Reitz et al., 2015). As well, among self-injuring individuals with BPD, the NSSI-relief association (relative to disgust) was positively associated with NSSI frequency and the number of NSSI methods used (hereafter referred to as NSSI versatility; Gratz el al., 2016). These results suggest that the implicit NSSI-relief association (relative to disgust) is an important factor to consider when working with individuals with BPD.

For the current study, I investigated the DSH IAT D score in the context of dialectical behaviour therapy (DBT; Linehan, 1993; 2015), an empirically supported

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[2] See Methods section for details.

treatment for BPD. DBT was developed by Marsha Linehan in the 1980s for individuals with BPD who were struggling with suicidal behaviour and NSSI. DBT is a comprehensive cognitive-behavioural treatment combining acceptance- and change-based treatment strategies and emphasizing improvements in emotion regulation (Linehan, 1993; 2015). DBT includes individual therapy, group skills training, a therapist consultation team, and the availability of the primary individual therapist to provide between-session phone coaching in the use of skills learned in therapy (Linehan, 1993; 2015). DBT skills fall into four categories: Mindfulness, emotion regulation, distress tolerance, and interpersonal effectiveness (Linehan, 1993; 2015). These skills are tailored to address specific deficits in emotional awareness and clarity, increase tolerance of strong emotions, teach effective strategies for getting needs met within interpersonal relationships, and replace maladaptive emotion regulation strategies (e.g., NSSI) with adaptive behaviours (Linehan, 1993; 2015).

Since its development in the early 1990s, numerous studies have demonstrated that DBT is an effective treatment for BPD (see: Harned et al., 2008; Linehan et al., 1991; Linehan et al., 1993; Linehan, Comtois, Murray et al., 2006; McCauley et al., 2018; Neacsiu et al., 2014). Of particular relevance to the current research, these studies have consistently demonstrated that DBT is effective in reducing the prevalence of suicidal behaviour and NSSI among individuals with BPD, a finding supported by a recent meta-analysis of DBT treatment studies (Panos et al., 2014).

One way in which DBT aims to reduce maladaptive behaviours (such as NSSI) is by teaching individuals with BPD adaptive ways in which to regulate emotions (Linehan, 1993; 2015). Theoretically, the more these adaptive behaviours are negatively reinforced (by providing relief), the stronger the cognitive associations between these behaviours and relief will become, and the more likely these individuals will be to turn to these behaviours for relief. As the new behaviours supersede NSSI as sources of emotional relief, the less often NSSI will be reinforced and thus the NSSI-relief association will, in theory, weaken, resulting in a smaller DSH IAT D score. Thus, I proposed that over the course of DBT treatment for BPD the DSH IAT D score would decrease, and that the DSH IAT D score might, therefore, be useful for tracking change in risk for NSSI over the course of treatment.

3.1. Primary Aims and Hypotheses

The primary aims of this research were, therefore, (1) to add to the existing literature on the role of emotional relief in NSSI among individuals with BPD and, (2) to test the utility of the DSH IAT in tracking change in NSSI risk in the context of treatment. I, therefore, investigated the relationship between the strength of the NSSI-relief association (as indexed by the D score) and NSSI over time in the context of DBT among individuals diagnosed with BPD.

3.1.1. Hypothesis 1

Consistent with prior research (Gratz et al., 2016), I hypothesized that at baseline (i.e., prior to starting treatment), lifetime NSSI frequency and versatility would be positively associated with the NSSI-relief association (i.e., D scores) beyond self-reported emotion relief motives.

3.1.2. Hypothesis 2

I also hypothesized that the NSSI-relief association would weaken over the course of one year from the start of DBT treatment (i.e., the D score would decrease).

3.1.3. Hypothesis 3

Finally, I hypothesized that the strength of NSSI-relief association at baseline would predict the rate of change in NSSI (frequency and versatility) from baseline to the end of one year, such that a stronger NSSI-relief association would predict a slower rate of change. Hypothesis 3a was that the rate of change of NSSI from baseline to the end of one year would predict the rate of change of the NSSI-relief association from baseline to the end of one year, such that a greater rate of change of NSSI would predict a greater rate of change of the NSSI-relief association.

Chapter 4.

Methods

4.1. Participants

Participants were recruited as part of a multi-site study conducted by the Centre for Addiction and Mental Health (CAMH) in Toronto, Ontario and the Personality and Emotion Research Lab (PERL) at Simon Fraser University in Burnaby, British Columbia (BC) assessing the effectiveness of a 6-month (versus 12-month) course of standard, comprehensive DBT. Recruitment was conducted via advertisements at hospitals and health centres and via referrals from health care professionals in the greater Toronto area in Ontario and the Metro Vancouver area in BC. As well, individuals who had participated in previous studies with PERL who had consented to being recontacted for future research were recruited via email.

4.1.1. Inclusion Criteria

To be eligible to participate, individuals had to (a) be 18 to 65 years old,[3] (b) meet full diagnostic criteria for BPD, (c) have engaged in two episodes of self-injury (suicidal or nonsuicidal) in the past five years and at least once the past eight weeks, (d) be proficient in English, and (e) have had either Ontario Health Insurance Plan coverage or BC Medical Services Plan health insurance for one year or more (as the larger study examined health economic outcomes).

4.1.2. Exclusion Criteria

Individuals were excluded from the study if they (a) had received DBT (defined as eight or more weeks of comprehensive standard DBT) in the past year, (b) met the DSM-IV (APA, 1994) criteria for a psychotic disorder or bipolar disorder I, (c) demonstrated evidence of dementia, (d) had an IQ of less than 70, (e) had serious physical health problems requiring hospitalization within the next year, or (f) had plans to

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[3] Individuals aged 18 years were required to have parental consent.

move outside of Ontario or BC in the next two years (to ensure all participants were able to attend all 24 months of assessments).

Prospective participants first completed a brief pre-screening interview by telephone. Individuals who were screened as likely to meet the eligibility criteria were invited to come to an in-person screening assessment. If, during this screening assessment, it was confirmed that the individual was eligible to participate in the study, they were invited to remain to complete the full baseline diagnostic assessment. Participants were reimbursed up to $65 for the baseline assessment (at $10 an hour) and $20 to $40 for completion of each of the follow-up assessments (at $10 an hour).[4]

Sample demographics appear in Tables 4.1. In the final sample (*N*=240), 79.2% of participants identified as female, 15.8% identified as male, and 5.0% identified as some other gender. Participants' ages ranged from 18 to 59 (*M*=27.75). The majority of participants identified as White (67.5%). Most participants reported that they were single, never married (75.4%). The majority of participants reported that some post-secondary education (32.5%) or college or trade certification (19.6%) were the highest levels of education they received.

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[4] See Procedures section for assessment details.

Table 4.1.   Demographics

Variable	*N*	*%*
Gender		
Female	190	79.2%
Male	38	15.8%
Other	12	5.0%
Ethnicity		
White	162	67.5%
Chinese	11	4.6%
South Asian (e.g., East Indian, Pakistani, Sri Lankan, etc.)	10	4.2%
Black	4	1.7%
Filipino	2	0.8%
Latin American	2	0.8%
West Asian (Iranian, Afghani)	1	0.4%
Korean	1	0.4%
Indigenous	6	2.5%
Other	40	16.7%
Marital Status		
Single, never married	181	75.4%
Married/Common law	38	15.8%
Separated	12	5.0%
Divorced	9	3.8%
Highest Level of Education		
Did not complete high school	22	9.2%
High school diploma	40	16.7%
Some post-secondary	78	32.5%
College or trade certification	47	19.6%

University degree	41	17.1%
Master's/Doctoral degree	12	5.0%
Past Year Income		
Less than $5000.00	46	19.2%
$5000.00-$9999.99	42	17.5%
$10,000.00-$14,999.99	46	19.2%
$15,000.00-$19,999.99	12	5%
$20,000.00-$24,999.99	24	10.0%
$25,000.00-$29,999.99	11	4.6%
$30,000.00-$49,999.99	31	12.9%
$50,000.00 or above	19	7.9%

N=240 (CAMH *N*=160. SFU *N*=80).

4.2. Assessment

4.2.1. Measures

Demographics

Demographic information was gathered at baseline via the Demographic Data Schedule (DDS; Linehan, 1982). The DDS is a 19-item questionnaire used to assess a range of demographic information, including questions pertaining to basic demographics such as age, gender, and ethnicity, and questions about more detailed demographic information, such as family childhood household composition and familial occupations.

Borderline Personality Disorder

Participants were assessed at baseline for BPD via the International Personality Disorder Examination (IPDE; Loranger, 1995). The IPDE is a semi-structured clinical interview developed by the World Health Organization and the US National Institutes of Health to standardize diagnostic assessment of DSM-IV (APA, 1994) personality disorders (Loranger, 1995). For this study, assessors used the IPDE-BPD module. The module consists of questions pertaining to the DSM-IV (APA, 1994) BPD criteria. These

criteria are consistent with the current criteria (DSM-5; APA, 2013). The IPDE has demonstrated good interrater reliability and adequate validity (Loranger et al., 1994).

Nonsuicidal Self-Injury

Lifetime frequency of suicidal self-injury and NSSI and versatility of methods was assessed at baseline via the Lifetime Suicide Attempt Self-Injury Interview (LSASII; Linehan & Comtois, 1996) and the Suicide Attempt Self-Injury Interview (SASII; Linehan, Comtois, Brown et al., 2006). Self-injury was assessed during follow-up assessments via the SASII.

The LSASII is a semi-structured interview that assesses self-injury (suicidal and nonsuicidal) over the past year and over the individual's lifetime (Linehan & Comtois, 1996). Assessors ask participants details about their self-injury including when they first self-injured, what methods they have used, how lethal those methods were, when and how often self-injury occurred, whether there was suicidal intent, and whether they required medical treatment (Linehan & Comtois, 1996). The score for lifetime NSSI frequency is calculated by summing all reported incidents of NSSI across all methods used in the individual's lifetime. The score for lifetime NSSI versatility is calculated by counting all unique NSSI methods reported across the individual's lifetime.

The SASII is a semi-structured interview that assesses self-injury (suicidal and nonsuicidal) over the past 3 months (Linehan, Comtois, Brown et al., 2006). Similar to the LSASII, assessors ask participants details about their self-injury including what methods they have used, how lethal those methods were, when and how often self-injury occurred, whether there was suicidal intent, and whether they required medical treatment (Linehan, Comtois, Brown et al., 2006). The SASII has demonstrated very good interrater reliability and adequate validity (Linehan, Comtois, Brown et al., 2006). The score for the past 3 months NSSI frequency is calculated by summing all reported incidents of NSSI that occurred within the past 3 months. The score for the past 3 months NSSI versatility is calculated by counting all unique NSSI methods that occurred within the past 3 months.

4.2.2. Administration

Assessment measures were administered by graduate level student assessors or post-doctoral fellows who were required to have completed training in psychopathology and assessment prior to beginning assessment training for this study. All assessors were trained by one of the principal or co-investigators on the administration of the IPDE-BPD, the SASII, and the LSASII. Trainees were required to demonstrate reliability in coding IPDE-BPD and LSASII demonstration videos prior to beginning assessments. Trainees were considered reliable if (a) they had greater than 85% agreement on dichotomous diagnostic variables and intraclass correlation coefficients (ICCs) greater than 0.85 for continuous variables with gold standard codes from the trainer on the first three demonstration videos or (b) 75% agreement on dichotomous diagnostic variables and ICCs greater than 0.75 for continuous variables with gold standard codes from the trainer on all demonstration videos (a total of eight LSASII videos and a total of five IPDE-BPD videos). Portions of the first five assessments for each assessor were reviewed by the assessment trainer to ensure accuracy. As well, each assessor coded ten actual IPDE-BPD videos and four actual LSASII videos and were required to maintain reliability in order to continue with assessments (75% agreement on dichotomous diagnostic variables and ICCs greater than 0.75 for continuous variables with gold standard codes from the trainer).[5] Finally, to prevent rater drift, assessors watched and coded a random IPDE-BPD and LSASII assessment video from one of the sites monthly, and discrepancies in coding were discussed and resolved at monthly assessor meetings.

4.3. Self-Report

4.3.1. Measures

Motives for Self-Injury

Emotion relief motives for self-injury were assessed at baseline (but not at other timepoints) via the Inventory of Statements About Self-Injury (ISAS; Klonsky & Olino, 2008). The ISAS is a self-report measure that assesses NSSI behaviours and the

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[5] At the time of this writing final interrater reliability scores were not yet available and I did not have access to the raw reliability data.

reported functions of said behaviours (i.e., what the individual believes NSSI behaviours do for them; Klonsky & Olino, 2008).

Participants are asked to rate on a three-point scale from 0 (*not relevant*) to 2 (*very relevant*) how relevant 39 statements pertaining to functions NSSI are to them (e.g., "when I self-harm I am calming myself down," "when I self-harm I am creating a boundary between myself and others," "when I self-harm I am expressing anger towards myself for being worthless or stupid;" Klonsky & Olino, 2008). The ISAS assesses six intrapersonal functions (affect regulation, self-punishment, anti-dissociation/feeling-generation, anti-suicide, marking distress, and self-care) and seven interpersonal of self-injury (interpersonal boundaries, sensation-seeking, peer-bonding, interpersonal influence, toughness, revenge, and autonomy). Scores are calculated for these 13 functions subscales by summing the scores of the relevant items (three items per subscale; Klonsky & Olino, 2008). This study used the affect-regulation subscale. Given that the scale asks what individuals think NSSI does for them when they engage in it, the reported functions can be conceptualized as motives for NSSI (i.e., the reasons why NSSI is engaged in). Thus, the affect-regulation subscale was used as a measure of self-reported emotional relief motives. The ISAS has demonstrated good reliability and validity (Klonsky & Glenn, 2009). The ISAS affect-regulation subscale's internal consistency was previously found to be α =0.73 (Lindholm et al., 2011). In the current study the ISAS affect-regulation subscale's internal consistency was α=0.62.

4.3.2. Administration

Self-report measures were administered via computer and completed in the laboratory.

4.4. Laboratory Task

4.4.1. The implicit Association Between NSSI and Emotional Relief

The NSSI-relief association was assessed at baseline and again at 6 and 12 months after the start of therapy, which lasted either 6 or 12 months depending on condition, via the DSH IAT (Gratz et al., 2016). The DSH IAT is a computerized timed sorting task consisting of seven trial blocks. Participants are asked to sort presented

items into target and attribute categories according to rules stated before each block. The target categories for the DSH IAT were deliberate self-harm and furniture and the attribute categories were "I feel relief" and "I feel disgust." Furniture was used as a neutral stimulus because it is unlikely to evoke an emotional response and it has been commonly used in other IATs (Gratz et al., 2016). Because a neutral emotional state, or the absence of emotional arousal, could be construed by participants as comparable to relief, a non-neutral attribute category was chosen to avoid overlap and allow differentiation between attribute categories (Gratz et al., 2016). Disgust was chosen as this non-neutral attribute as disgust is a common response to self-harm for individuals with and without a history of self-harm (Gratz et al., 2016).

Reaction time is used as a measure of the strength of the association between targets and attributes (i.e., the faster the reaction time the stronger the association). The implicit measure of the NSSI-relief association consists of a D score. When scored, the DSH IAT returns for each participant a single D score which is indicative of the strength of the NSSI-relief association (relative to the NSSI-disgust association). Higher D scores indicate a stronger NSSI-relief association than NSSI-disgust association. The DSH IAT has demonstrated construct validity, predictive utility, and incremental validity (Gratz et al., 2016).

E-Prime 2.0 software (Psychology Software Tools, Pittsburgh, PA) was used to present the IAT to participants. For each trial block, categories were presented in the top left and right corners of the screen. Stimuli to be sorted appeared in the centre of the screen. In a session prior to completing the IAT, participants were asked to sort and rank 20 deliberate self-harm images (e.g., cuts on an arm) and 20 neutral images from the International Affective Pictures System (Lang et al., 2008) into different categories (including self-harm). The IAT for each individual was then personalized with the six images that they ranked as being most representative of self-harm. Personalizing an IAT increases the test's validity and has been recommended for research using IATs (Han et al., 2006). The IAT also included six images of furniture. These 12 images (six self-harm and six furniture images) were the stimuli for the target categories. The stimuli for the attribute categories were words which related to each attribute (e.g., "gross" for disgust or "relax" for relief). Participants were instructed to sort each stimulus into the appropriate category as quickly as possible by hitting the key associated with the correct side of the screen ("Q" for the left and "P" for the right). If a participant sorted a stimulus

into the wrong category, the word "incorrect" appeared on the screen. The task would not move on until the participant corrected the mistake.

The seven trial blocks were as follows. (1) Participants sorted 24 attribute related words into the relief (left) or disgust (right) categories; (2) participants sorted 24 images into the self-harm (left) or furniture (right) categories; (3) participants sorted a total of 24 words and images into combination categories of "self-harm and relief" (left) and "furniture and disgust" (right); (4) participants sorted a total of 40 words and images into combination categories of "self-harm and relief" (left) and "furniture and disgust" (right); (5) participants sorted 24 words into the disgust (left) or relief (right) categories; (6) participants sorted a total of 24 words and images into combination categories of "self-harm and disgust" (left) and "furniture and relief" (right); and (7) finally, participants sorted a total of 40 words and images into combination categories of "self-harm and disgust" (left) and "furniture and relief" (right). Stimuli were presented randomly within blocks. Blocks 3 and 4 were congruent for self-harming individuals (i.e., self-harm with relief) while blocks 6 and 7 were incongruent (i.e., self-harm with disgust). Blocks 3–4 and 6–7 were counterbalanced across participants. Throughout, each new stimulus was presented 500 ms after a correct response. See Appendix B for examples of the DSH IAT stimuli screens.

As per Greenwald et al. (2003), trials with response latencies greater than 10,000 ms were excluded from analyses (resulting in 51 deletions at baseline, 9 deletions at 6 months, and 46 deletions at 12 months). Greenwald et al. also recommend that data from participants who had more than 10% of their response latencies under 300 ms be excluded from analyses. No participants, however, had more than 10% of their response latencies under 300 ms at any timepoint, and thus no participant's data was excluded. The D score was calculated using the formula:

$$((Mean_{Block\ 6} - Mean_{Block\ 3})/SD_{Block\ 3\ and\ 6}) + (Mean_{Block\ 7} - Mean_{Block\ 4})/SD_{Block\ 4\ and\ 7}))/2$$

4.5. Procedures

4.5.1. Pre-Screening Interview

Individuals who, during recruitment, expressed interest in participating in the study were contacted by telephone to complete a brief pre-screening interview by a

trained research assistant. This interview consisted of a series questions pertaining to the inclusion and exclusion criteria, most of which were simple "yes" or "no" questions with some follow-up depending on the response. For BPD, an existing diagnosis from a healthcare professional was sufficient to meet that inclusion criterion for screening purposes. If a prospective participant had no previous BPD diagnosis, the research assistant asked more detailed questions pertaining to the nine DSM-5 BPD diagnostic criteria. The BPD criterion was then considered met if the individual endorsed five out of the nine diagnostic criteria (as per DSM-5; APA, 2013).

4.5.2. In-Person Screening and Baseline Assessment

Individuals who met the criteria during pre-screening were invited to an in-person screening assessment. Among other interviews, the DDS, IPDE-BPD module, LSASII, and SASII were administered during this session. If prospective participants were confirmed during this screening assessment to be eligible per inclusion and exclusion criteria to participate in the study, they were asked to remain to complete the full baseline assessments (diagnostic and otherwise) and to sort and rank the images used to personalize their IATs. The screening and baseline diagnostic assessments were conducted by graduate or post-doctoral level research assistants using validated interviews. Once the baseline diagnostic assessment was complete, the participants were invited to return for a second baseline assessment session wherein they completed a number of online self-report measures (including the ISAS) and the IAT. Participants were informed of their random assignment to either the 6-month or 12-month DBT condition at the end of this second day of their baseline assessment.

4.5.3. DBT Treatment

Depending on condition, participants received either 6 months or 12 months of full, comprehensive DBT. This treatment included individual therapy, group skills training, the availability of the primary individual therapist for between-session phone coaching in the use of DBT skills, and the primary therapist and skills group facilitators were part of a consultation team which met regularly. Individual therapists and skills group facilitators were registered psychologists who were experienced DBT clinicians, or master's or doctoral level clinicians trained in DBT. Some master's or doctoral level clinicians had prior DBT training from accredited programs before joining the treatment

team. Those clinicians who did not have prior training were provided with extensive training in DBT from registered psychologists, who were experienced DBT clinicians, prior to providing therapy. Master's or doctoral level clinicians were supervised by experienced DBT clinicians. To ensure treatment fidelity, individual therapy and group skills sessions were video recorded, and five individual session videos from each clinician and five videos from each skills group were randomly selected and coded for treatment adherence using the University of Washington DBT Adherence Rating Scale (Linehan & Korslund, 2003). This scale provides scores reflecting adherence to the intervention strategies of DBT as per the treatment manuals (Linehan & Korslund, 2003). Coding was done by clinical psychology graduate student coders trained to reliability with expert coders and 10% of the coded videos were sent to the University of Washington to prevent coder drift. All coded sessions were found to be adherent. Therapist competence and treatment delivery was also monitored via the weekly consultation team meetings, which is standard practice for DBT.

4.5.4. Follow-Up Assessments

Follow-up assessments with participants were scheduled for every 3 months (beginning 3 months after the start of treatment) for 24 months. The IAT was re-administered at the 6-month and 12-month follow-ups. The SASII was re-administered at every follow-up (i.e., every 3 months), along with an interview assessing medical treatment received in the past 3 months, and a battery of self-report measures including measures assessing borderline personality disorder symptoms and related constructs (e.g., impulsivity, emotion dysregulation), self-destructive behaviours (e.g., drug and alcohol abuse), DBT skill use, psychological symptoms (e.g., depression, anxiety), and therapeutic alliance.

Chapter 5.

Data Analysis

Prior to analyses, scores for the ISAS affect-regulation subscale, the baseline and follow-up D scores, and lifetime, past 3 months (i.e., baseline), and follow-up NSSI frequency and versatility were calculated.

5.1. Descriptive Statistics

The minimum, maximum, mean, standard deviation, skew, and kurtosis were calculated for each of the continuous and count variables (see Table 6.1) and percentages were calculated for the demographic variables (see Table 4.1).

5.2. Preliminary Analyses

Site differences in D scores and demographic and NSSI variables were examined via *t* tests and *chi*-square analyses as appropriate. No significant differences were expected.

Scores for NSSI frequency and versatility, the ISAS affect-regulation subscale, and the D scores were inspected for non-normality (i.e., *skew*>3.0, *kurtosis*>10.0; Kline, 2011).

As well, associations between D scores, the ISAS affect-regulation subscale, and the NSSI variables were examined via correlation analyses (see Table 6.2). Previous research found that DSH IAT D scores were positively correlated with lifetime NSSI frequency (r= .41, p<.05) and versatility (r= .39, p<.05) among individuals with BPD who engage in NSSI (Gratz et al., 2016), and similar positive correlations were expected in this study.

5.3. Exploratory Analyses

Condition (6-month versus 12-month) was dummy coded and included in initial analyses to check whether condition affected the results.

5.4. Hypothesis 1

To investigate Hypothesis 1, that at baseline the lifetime frequency of NSSI and versatility of NSSI methods (i.e., number of methods used for NSSI) would be positively associated with the D score (beyond self-reported emotion relief motives), hierarchical multiple regression (HMR) analyses were conducted. The ISAS affect-regulation subscale score was included in Block 1, and the baseline D score was entered in Block 2. NSSI frequency and versatility were entered as dependent variables and separate analyses were conducted for each.

5.5. Hypothesis 2

For Hypothesis 2, that the D score would decrease over the course of 12 months from the start of DBT treatment, latent growth curve modelling (LGCM) was employed (see Figure 5.1 for model). Research investigating change in relevant IAT D scores over the course of treatment for spider phobias and social anxiety have found medium to large pre- to post-treatment effect sizes (d=.47-.85; Teachman & Woody, 2003; Gamer et al., 2008). The effect size for change in DSH IAT D scores from baseline to 12 months from the start of DBT treatment was expected to fall within a similar range.

LGCM allows for the investigation of the trajectory of change over time for a variable measured longitudinally (i.e., at multiple time points). LGCM analyses were conducted using *Mplus* (Muthén & Muthén, 2017).
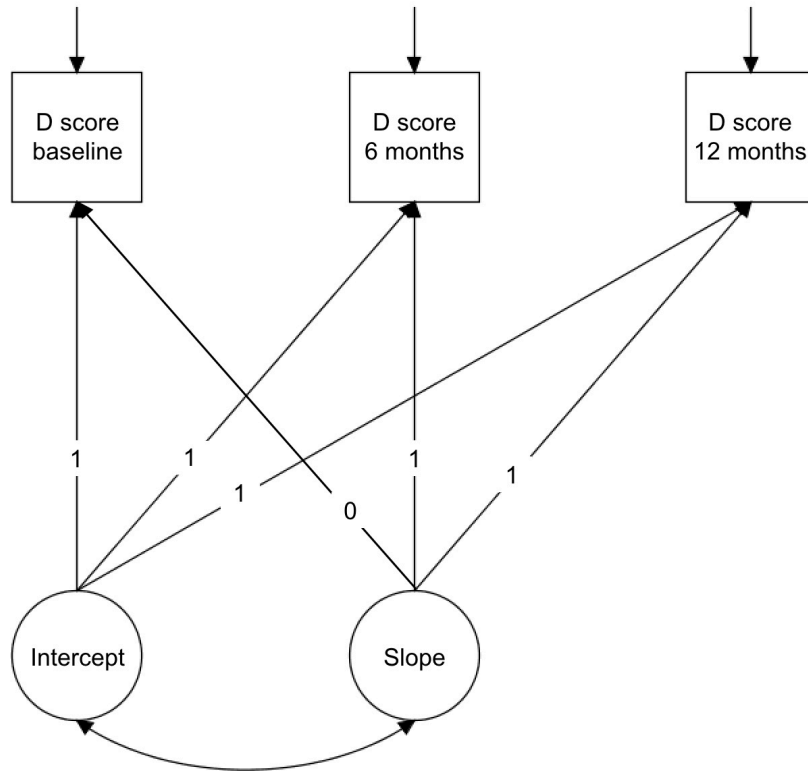
Figure 5.1.   Latent growth curve model for D score

5.6. Hypothesis 3

For Hypothesis 3, that the D score at baseline would predict the rate of change in NSSI from baseline to the end of one year, such that higher D scores would predict a slower rate of change, and 3a the rate of change of NSSI from baseline to the end of one year would predict the rate of change of the NSSI-relief association from baseline to the end of one year, such that a greater rate of change of NSSI would predict a greater rate of change of the NSSI-relief association, parallel latent growth curve modelling (PLGCM) was employed (see Figure 5.2 for model).

PLGCM allows for the simultaneous investigation of the trajectory of change over time for two variables measured longitudinally, while incorporating direction paths between the variables to investigate the effects of the rate of change of one variable on the rate of change of the other (and vice versa). PLGCM analyses were conducted using *Mplus* (Muthén & Muthén, 2017).
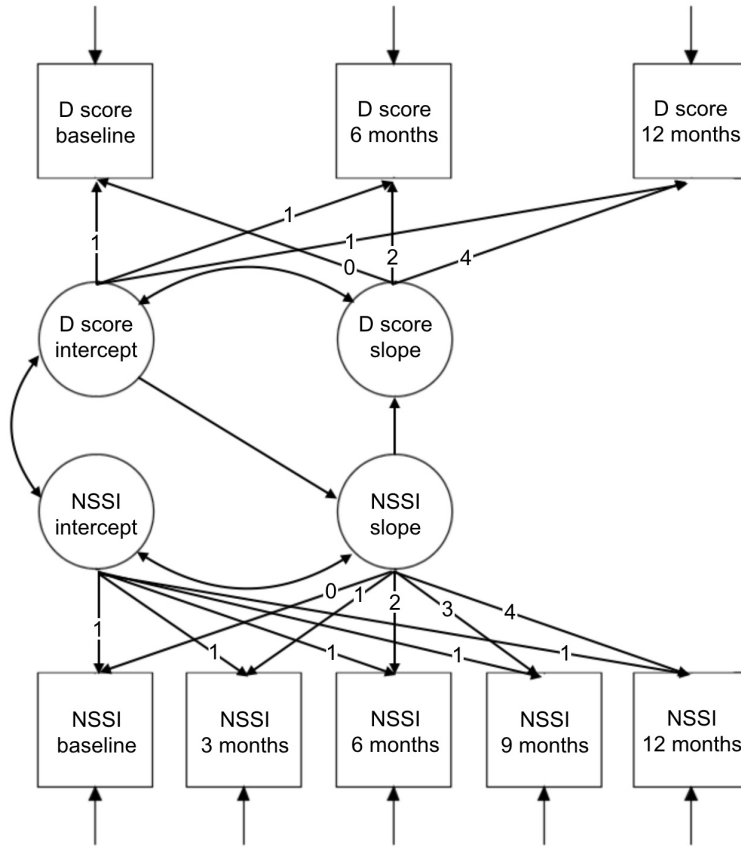
Figure 5.2.   Parallel latent growth curve model for D score and NSSI
Note: The same model was used for NSSI frequency and versatility.

5.7. Missing Data

For Hypotheses 1 analyses were run with listwise deletion. For Hypothesis 2 and 3, the full information maximum likelihood (FIML) method was employed to estimate missing data.

Chapter 6.

Results

6.1. Descriptive Statistics

Table 6.1.   Descriptive Statistics

| Variable	*Min*	*Max*	*Mean (SD)*	*Median*	*Skew (SE)*	*Kurtosis (SE)*	*N*
ISAS-AR	0	6.00	5.00 (0.09)	6.00	-1.45 (0.16)	1.91 (0.31)	240
D score baseline	-1.07	0.75	-0.23 (0.03)	-0.26	0.31 (0.16)	-0.47 (0.32)	232
D score 6 months	-1.08	0.71	-0.23 (0.03)	-0.22	0.31 (0.16)	-0.47 (0.32)	180
D score 12 months	-1.08	0.66	-0.29 (0.03)	-0.32	0.26 (0.20)	-0.35 (0.39)	152
NSSI frequency lifetime[a]	0.00	21322.00	638.58 (114.47)	110.50	7.79 (0.16)	82.92 (0.32)	236
NSSI frequency baseline[a]	0.00	288.00	15.21 (2.29)	5.00	5.21 (0.16)	32.05 (0.31)	238
NSSI frequency 3 months[a]	0.00	90.00	5.24 (0.82)	1.00	4.11 (0.17)	19.92 (0.33)	210
NSSI frequency 6 months[a]	0.00	70.00	2.88 (0.59)	0.00	5.34 (0.17)	33.56 (0.35)	196
NSSI frequency 9 months[a]	0.00	180.00	3.20 (1.19)	0.00	8.91 (0.18)	87.10 (0.36)	186
NSSI frequency 12 months[a]	0.00	161.00	3.50 (1.16)	0.00	7.42 (0.18)	63.37 (0.36)	183
NSSI versatility lifetime	0.00	9.00	3.24 (0.10)	3.00	0.51 (0.16)	0.62 (0.32)	236
NSSI versatility baseline	0.00	4.00	1.68 (0.06)	2.00	0.49 (0.16)	- 0.001 (0.31)	238
NSSI versatility 3 months	0.00	3.00	0.84 (0.06)	1.00	0.77 (0.17)	0.05 (0.33)	210
NSSI versatility 6 months	0.00	5.00	0.63 (0.06)	0.00	1.63 (0.17)	4.12 (0.35)	196

Variable	Min	Max	Mean (SD)	Median	Skew (SE)	Kurtosis (SE)	N
NSSI versatility 9 months	0.00	4.00	0.48 (0.06)	0.00	1.81 (0.18)	3.69 (0.36)	186
NSSI versatility 12 months	0.00	5.00	0.49 (0.06)	0.00	2.32 (0.18)	6.95 (0.36)	183

Note: ISAS-AR = Inventory of Statements About Self-Injury, Affect-Regulation subscale. NSSI = Nonsuicidal self-injury.

[a] Raw frequency data are presented but these data were log_{10} transformed for analyses.

6.2. Preliminary Analyses

There was a significant site difference in baseline NSSI frequency (*MD*=0.15, *p*=0.03). There were no other significant site differences in variables of interest (*p*s>0.05). As there was a significant site difference in baseline NSSI frequency, site was dummy coded and included in analyses involving baseline NSSI frequency to check whether this difference affected results. The inclusion of the site variable did not affect the results, and thus only analyses with the site variable excluded are reported upon.

Inspection revealed that the ISAS affect-regulation subscale scores, the lifetime, baseline and follow-up NSSI versatility scores, and the baseline and follow-up D scores were normally distributed (*skew*=-1.45–2.32 *kurtosis*=-0.001–6.95). Lifetime, baseline, and follow-up NSSI frequency scores were outside the range of normality (*skew*=4.11–8.91, *kurtosis*=19.92–87.10) and were thus log_{10} transformed prior to analyses, including those reported in Table 6.2. Transformed NSSI frequency scores were normally distributed (*skew*=-0.03–2.51, *kurtosis*=-0.09–7.18).

Contrary to expectations, the D scores at baseline were not correlated with lifetime NSSI frequency (*r*=-0.08, *p*>0.05) or versatility (*r*= 0.05, *p*>0.05). The baseline D scores were, however, positively correlated with baseline NSSI frequency (*r*=0.14, *p*<0.05) and self-reported affect regulation motives for NSSI (*r*=0.15, *p*<0.05).

Table 6.2.   **Intercorrelations**

	D score baseline	*ISAS-AR*	*NSSI frequency lifetime*	*NSSI versatility lifetime*	*NSSI frequency baseline*	*NSSI versatility baseline*
D score baseline	–					
ISAS-AR	0.15*	–				
NSSI frequency lifetime[a]	0.08	0.20**	–			
NSSI versatility lifetime	0.05	0.16*	0.52**	–		
NSSI frequency baseline[a]	0.14*	0.17**	0.59**	0.31**	–	
NSSI versatility baseline	0.01	0.21**	0.29**	0.42**	0.54**	–

Note: ISAS-AR = Inventory of Statements About Self-Injury, Affect-Regulation subscale. NSSI = Nonsuicidal self-injury.
[a] $\log_{10}$ transformed.
* $p < 0.05$.
** $p < 0.01$.

6.3. Exploratory Analyses

The inclusion of the condition variable did not affect the results, and thus only analyses with the condition variable excluded are reported upon below.

6.4. Hypothesis 1

6.4.1. NSSI Frequency

After listwise deletions, data from 229 participants were included in the HMR analysis (see Table 6.3). The linear regression of the ISAS affect-regulation subscale score on lifetime NSSI frequency was statistically significant ($R^2=0.06$, $SE=0.81$, $F_{(1,227)}=14.47$, $p<0.001$). There was no significant change in R^2 with the addition of the D score in Step 2 ($\Delta R^2=0.002$, $\Delta F_{(1,226)}=0.47$, $p=0.49$). Thus, contrary to predictions, the D

score was not significantly associated with lifetime NSSI frequency beyond self-reported affect regulation motives for NSSI.

Table 6.3. **HMR of D Scores and Self-Reported Emotional Relief Motives as Predictors of Lifetime NSSI Frequency**

	B	*SE$_B$*	*t*	*F*	*R²*	*ΔR²*	*ΔF*
Step 1				14.47***	0.06		
ISAS-AR	0.16	0.04	3.80***				
Step 2				7.46**	0.06	0.002	0.47
ISAS-AR	0.15	0.04	3.66***				
D score	0.09	0.14	0.05				

Note: ISAS-AR = Inventory of Statements About Self-Injury, Affect-Regulation subscale. NSSI = Nonsuicidal self-injury.
**   *p*<0.01.
***   *p*<0.001.

6.4.2. NSSI Versatility

After listwise deletions, data from 229 participants were included in the HMR analysis (see Table 6.4). The linear regression of the ISAS affect-regulation subscale score on lifetime NSSI versatility was statistically significant (R^2=0.03, *SE*=1.60, $F_{(1,227)}$=6.76, *p*=0.01). There was no significant change in R^2 with the addition of the D score in Step 2 (ΔR^2=0.001, $\Delta F_{(1,226)}$=0.20, *p*=0.65). Thus, contrary to predictions, the D score was not significantly associated with lifetime NSSI versatility beyond self-reported affect regulation motives for NSSI.

Table 6.4. **HMR of D Scores and Self-Reported Emotional Relief Motives as Predictors of Lifetime NSSI Versatility**

	B	*SE$_B$*	*t*	*F*	*R²*	*ΔR²*	*ΔF*
Step 1				6.76*	0.03		
ISAS-AR	0.21	0.08	2.60*				
Step 2				3.47*	0.03	0.001	0.20
ISAS-AR	0.21	0.08	2.50*				
D score	0.12	0.27	0.45				

Note: ISAS-AR = Inventory of Statements About Self-Injury, Affect-Regulation subscale. NSSI = Nonsuicidal self-injury. *p*<0.05.

6.5. Hypothesis 2

Three participants did not complete the IAT at any timepoint. Thus, data from only 237 participants were included in the LGCM analysis. Fit indices suggested that the model (see Figure 6.1) was a good fit for the data ($\chi^2_{(1)}$=0.94, *p*=0.33; *CFI*=1.00;

RMSEA=0.00, *90% CI* [0.00, 0.17]; *SRMR*=0.02). Contrary to predictions, there was no significant decline in latent D scores over the course of 12 months from the start of DBT treatment (M_{LINEAR}=-0.28, *z*=-1.15, *p*=0.25).
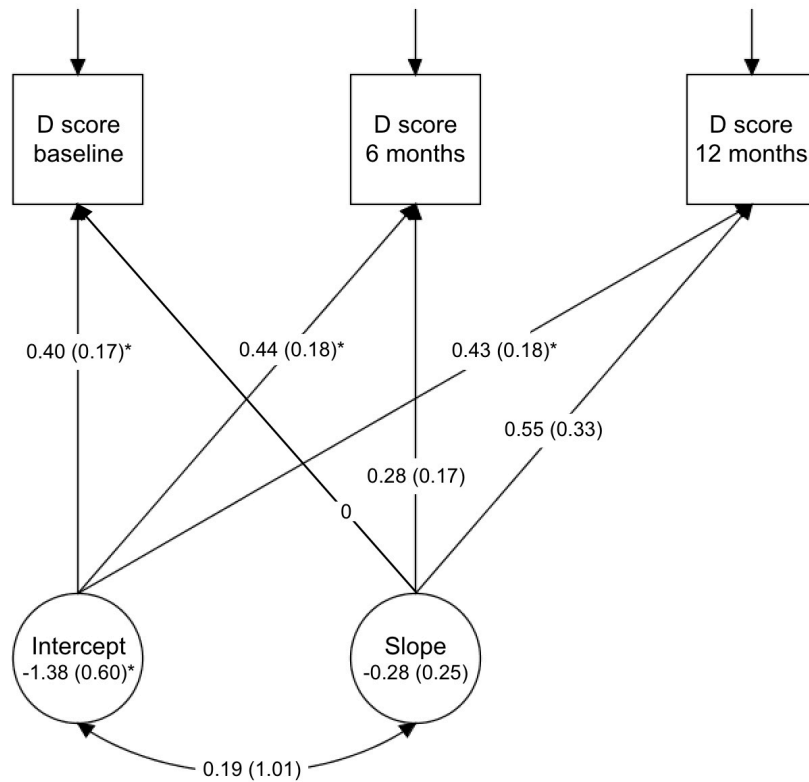
Figure 6.1.   Latent growth curve model for D score with parameter estimates
p<0.05.

6.6. Hypothesis 3

6.6.1. NSSI Frequency

Fit indices suggested that the model examining the relationship between baseline D scores, change in NSSI frequency, and change in D scores (see Figure 5.2) was not a good fit for the data ($\chi^2_{(23)}$=137.31, *p*=0.00; *CFI*=0.72; *RMSEA*=0.14, *90% CI* [0.12, 0.17]; *SRMR*=0.11) and thus the parameter estimates were not interpretable.

6.6.2. NSSI Versatility

Fit indices suggested that the model examining the relationship between baseline D scores, change in NSSI versatility, and change in D scores (see Figure 5.2) was not a good fit for the data ($\chi^2_{(23)}$=119.76, p=0.00; *CFI*=0.51; *RMSEA*=0.13, *90% CI* [0.11, 0.16]; *SRMR*=0.12) and thus the parameter estimates were not interpretable.

6.7. Post-Hoc Analyses

To confirm that NSSI frequency and versatility scores decreased over the course of 12 months from the start of DBT treatment as expected, I conducted repeated measures analysis of variance (ANOVA) analyses.

6.7.1. NSSI Frequency

Repeated measures ANOVA revealed that the mean NSSI frequency score differed significantly between the five time points ($F_{(3.12,\ 509.18)}$=114.98, p<0.001). Post hoc tests revealed statistically significant reductions in NSSI frequency means between baseline and 3 months, and between 3 months and 6 months (*ps*<0.001), but no statistically significant reductions in NSSI frequency means between 6 months and 9 months, nor between 9 months and 12 months (*ps*>0.05).

6.7.2. NSSI Versatility

Repeated measures ANOVA revealed that the mean NSSI versatility score differed significantly between the five time points ($F_{(3.52,\ 573.70)}$=89.05, p<0.001). Post hoc tests revealed statistically significant reductions in NSSI versatility means between baseline and 3 months, and between 3 months and 6 months (*ps*<0.001), but no statistically significant reductions in NSSI versatility means between 6 months and 9 months, nor between 9 months and 12 months (*ps*>0.05).

Chapter 7.

Discussion

This was the first study to investigate the relationship between the strength of the cognitive NSSI-relief association (relative to disgust), as measured by the DSH IAT, and NSSI over time in the context of DBT among individuals diagnosed with BPD. Findings did not support the primary hypotheses for this research. Neither lifetime NSSI frequency nor versatility were associated with the cognitive NSSI-relief association (relative to disgust; i.e., the D scores) beyond self-reported emotion relief motives. As well, the D scores did not decrease over the course of one year from the start of DBT treatment. Finally, my hypothesized models examining the relationship between baseline D scores, change in NSSI frequency and versatility, and change in D scores were not a good fit for the data.

The finding that neither lifetime NSSI frequency nor versatility were associated with the NSSI-relief association (relative to disgust) beyond self-reported emotion relief motives is inconsistent with previous research using the DSH IAT (Gratz et al., 2016). Research reporting on the development and validation of this measure found a positive association between the NSSI-relief association (relative to disgust) and NSSI frequency and versatility beyond self-reported emotion relief motives among self-injuring individuals with BPD (Gratz et al., 2016). There were some differences between the two studies. Notably, the studies had different target samples. Gratz et al. (2016) sought people with a history of recent, repeated NSSI, whereas the current study sought treatment-seeking individuals with BPD and recent, recurrent suicidal or NSSI behaviour. Consequently, Gratz et al. recruited participants from the community through flyers posted at coffee shops, churches, stores, hospitals, colleges, and clinics. Participants in my study were solicited from a clinical population through recruitment done at hospitals and health centres and via referrals from health care professionals. Thus, the present study used a clinical sample of treatment-seeking individuals with BPD, whereas Gratz et al. used a community sample. It is possible that unique characteristics of the clinical sample used for this study account for the differences in the results between the studies. For example, while participants in Gratz et al. and my study were similarly assessed for BPD by graduate or post-doctoral level research assistants using validated interviews, all of the

individuals in my sample were already involved in the mental health system, and it is therefore possible that they had more clinically severe BPD symptoms.[6] This difference in symptom severity may somehow account for the absence of an association between the D score and NSSI frequency or versatility in my study. Notably, the mean baseline D score in the present study (M=-0.23, SD=0.03) was lower than the mean baseline D score for the BPD group in Gratz et al. (M=-0.06, SD=0.48). This difference suggests that participants in my study had weaker cognitive NSSI-relief associations (relative to disgust) than the participants in the previous study.

One possible explanation for this difference in the strength of the cognitive NSSI-relief (versus disgust) associations is that individuals with more clinically severe BPD symptoms may have engaged in more NSSI and thus habituated to the emotion-relieving effects such that they no longer experience the emotional relief post-NSSI.[7] The cognitive NSSI-relief association, therefore, may have weakened over time in the absence of negative reinforcement.[8] According to behavioural theory, when the reinforcing consequence of a behaviour is removed, the behaviour will gradually cease, a phenomenon known as extinction. That NSSI still occurred at baseline suggests that for these individuals, NSSI was being maintained by other processes (e.g., other reinforcing consequences) or perhaps a persistent explicit expectation of emotional relief in the absence of consistent emotion-relieving consequences. Assuming that the D score is a good proxy for the experience of emotion-relieving consequences,[9] then the weak correlation between self-reported emotion relief motives and the D score at baseline found in the present study (r=0.15, p<0.05) may suggest that for these individuals with potentially more clinically severe symptoms, NSSI was being maintained in part by explicit expectations of the emotion relieving consequences of NSSI, rather than relief itself. Indeed, the results of my HMR analyses potentially support this, as self-

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[6] Gratz et al. (2016) does not report any measure of symptom severity.

[7] While there is evidence from self-report and laboratory studies that individuals who engage in chronic NSSI experience less pain than individuals who do not (e.g., Hooley et al., 2010; Nock et al., 2006), which may be indicative of a habituation effect, I could find no studies that investigated whether individuals who engage in chronic NSSI experience less relief post-NSSI than individuals who have engaged in it less frequently.

[8] Alternatively, the cognitive NSSI-relief may not have weakened, rather an association formed through extinction learning may be interfering with it (see section 7.1 below for more on extinction learning).

[9] This assumption may prove to be false. Studies are needed to examine the association of the DSH IAT D scores with reported or observed consequences of NSSI.

reported emotion relief motive scores were significantly associated with lifetime NSSI frequency (β=0.16, *SE*=0.04, *t*=3.80, *p*<0.001) and versatility (β=0.21, *SE*=0.08, *t*=2.60, *p*=0.01).

It is also possible that among my participants, over time, NSSI had become associated with their identities. For these individuals, then, this cognitive NSSI-self association may have contributed to the maintenance of NSSI in the absence of emotional relief. Supporting this possibility, Glenn et al. (2016), using a NSSI-self IAT, found that for individuals who engaged in NSSI the strength of the NSSI-self association predicted NSSI over the following year.

If it is true that the participants in my study had habituated to the relieving consequences of NSSI and were less likely to experience relief after engaging in NSSI, this habituation could also explain why, contrary to my prediction, the D scores did not decrease over the course of one year from the start of DBT treatment. If these individuals no longer experienced relief after NSSI, then teaching them other ways in which to achieve emotional relief was not really removing a reinforcing consequence of NSSI and thus may not have weakened the NSSI-relief association.

An additional explanation for the findings could be that IAT D scores did not change significantly throughout the study period. There was, however, significant change in NSSI versatility and frequency. The models tested in this research were predicated on what was hypothesized to be a transactional relationship between the change in the D scores and change in NSSI over time, and the D scores did not change, while NSSI did. As well, if the participants in my study had habituated to NSSI and no longer experienced relief after engaging it (i.e., if it was no longer being negatively reinforced by relief), then a reduction in NSSI would not be expected to affect the D score.

Another notable difference between the present study and that of Gratz et al. (2016) could explain some of the differences in our results. Specifically, the two studies used different methods to assess NSSI. Gratz et al. used the Deliberate Self-Harm Inventory (DSHI; Gratz, 2001), a self-report measure, whereas the present study used the LSASII, a semi-structured interview. The use of a semi-structured interview is likely to have resulted in more accurate counts for lifetime NSSI frequency and versatility,

because assessors in this study were trained to ask follow-up questions to clarify participants' responses. This follow-up enabled assessors to determine how participants arrived at their counts (e.g., did they randomly pick numbers or did they try to determine frequency counts systematically?), ensure that the reported NSSI met the accepted definition of NSSI, and guide participants to more robust estimations (e.g., by suggesting more systematic methods for estimating). More robust estimations are important because otherwise results could be confounded by biases, current emotional state, or other factors influencing the validity of estimates. For example, if individuals with stronger cognitive NSSI-relief associations tend to over-estimate NSSI frequency and versatility, then it is possible that the associations between D scores and NSSI frequency and versatility found in Gratz et al. were actually artifacts of this over-reporting on the DSHI (i.e., higher D scores were associated with higher estimates, not more NSSI).

Finally, it should be noted that as Gratz et al. (2016) were not specifically seeking individuals with BPD, the BPD group was relatively small (*n*=32). With a smaller sample size, the probability of drawing a sample that is uncharacteristic of the general population is higher. It is possible that the results of that study were thus unduly influenced by an uncharacteristic sample.

The unexpected results from the current research suggest the DSH IAT may not be sensitive to treatment, at least in the case of DBT treatment for individuals with BPD. The strength of the cognitive NSSI-relief associations (relative to disgust; i.e., D scores) did not change over the course of 12 months from the start of treatment, while NSSI did. This reduction in NSSI is consistent with prior research which has demonstrated that DBT consistently reduces NSSI over the course of treatment and follow-up among individuals with BPD (Harned et al., 2008; Linehan et al., 1991; McCauley et al., 2018).[10]

7.1. Extinction Learning

Of note, while the mean D score in my study (*M*=-0.23, *SD*=0.03) was lower than the mean D score in the BPD group found in Gratz et al. (2016), it was actually higher

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[10] While the primary analyses of the DBT study are ongoing, the significant reductions in NSSI over the course of one year and the preliminary analyses of other outcome variables suggest that DBT was an effective treatment for individuals in this study.

than the mean D score for the control group made up of individuals who did not engage in NSSI in that study (*M*=-0.39, *SD*=0.32). This suggests that the individuals in my study have stronger cognitive NSSI-relief (versus disgust) associations than individuals who do not engage in NSSI. This would be consistent with research on extinction learning that suggests that the original learning is not erased during the extinction process. Rather, a new association is formed between the behaviour and the absence of the previously reinforcing consequence which interferes with the original learning (Urcelay, 2012). If it is as I've postulated, that the individuals in my sample were no longer experiencing relief post-NSSI, then extinction learning theory suggests that they would have formed a competitive cognitive NSSI-no relief association. This NSSI-no relief association would cognitively interfere with the NSSI-relief association, which could slow participants' responding to NSSI-relief pairings on the DSH IAT, thus resulting in lower D scores. While the D scores in my study did not appear to contribute to NSSI, if the comparatively stronger cognitive NSSI-relief (versus disgust) associations I found are indicative of the persistence of the original cognitive NSSI-relief associations, as predicted by extinction learning theory, then this may signal eventual NSSI relapse. Perhaps through a re-experiencing of relief if NSSI is engaged in when treated individuals face future stressors. This relapse due to re-experiencing of relief would be consistent with the phenomenon of reinstatement, wherein the originally learned behaviour re-emerges after extinction when the reinforcing consequence is re-introduced (Crombag, 2008; Urcelay, 2012). It would be interesting to try and measure the cognitive NSSI-no relief association via use of an IAT, though words relating the attribute "no relief" might be difficult to identify.

Another possible explanation for differences in D scores between studies and between groups is that because the use of "disgust" as a comparison attribute means that reaction times on DSH IAT D are actually influenced by two competitive cognitive associations: 1) NSSI-relief and 2) NSSI-disgust. The D score, therefore, is representative of the relative strength of these associations. It is possible that among individuals with more clinically severe BPD symptoms, as the individuals in my study potentially were, NSSI over time becomes associated with greater feelings of disgust.

7.2. Other Associations with or Motivations to Engage in NSSI

Finally, the results of my study also suggest that by focussing on relief, I may have overlooked other processes that maintain NSSI. Though relief is the most commonly reported motive for NSSI, there are other documented motives (Klonsky, 2007). For example, self-punishment is frequently endorsed as a motive for NSSI (Brown et al., 2002; Kleindienst et al., 2008; Klonsky, 2007) and self-report studies have found some evidence for anti-dissociation, interpersonal, sensation-seeking, and anti-suicide motives (Klonsky, 2007). As well, a recent daily diary study found evidence for perceived interpersonal support as a reinforcing consequence of NSSI (Turner et al., 2016). Turner et al. (2016) found that individuals perceived more interpersonal support after revealing their NSSI to others, and that this perception increased the risk for NSSI the next day. Finally, as I previously mentioned, there is some evidence for a cognitive NSSI-self association that may maintain NSSI (Glenn et al., 2016).

7.3. Limitations and Future Directions

Of course, my study has some limitations. First, the IAT was not administered at every follow-up. Although the D score did not significantly change over the course of the study period, collecting more data on DSH IAT D scores might have revealed variability across timepoints, and this variability could have been associated with NSSI. Second, the ISAS affect-regulation subscale's internal consistency was questionable (α=0.62). This questionable internal consistency may suggest that the subscale items were not reliably measuring the same construct (i.e., affect-regulation) in my sample. Third, there were also more women in the sample than men, which makes the results less generalizable to samples of men with BPD. This oversampling of women, however, may actually reflect what is often seen in treatment settings. Though BPD prevalence rates for men and women have been found to be similar (Grant et al., 2008), women with BPD are more likely to receive treatment than men (Goodman et al., 2010). Finally, using disgust as the comparison attribute for the DSH IAT could have attenuated the actual association of relief with NSSI, as disgust is likely a common association with NSSI given the likelihood of visible tissue damage. The personalized images of NSSI used in this study also might have been associated with disgust. Notwithstanding these

limitations, disgust was chosen because it is a common reaction to NSSI among people who do and do not engage in the behaviour and may be preferable to alternative attributes (e.g., no emotions, which is too similar to relief, or distress, which often prompts NSSI; Gratz et al., 2016).

The results of the current study suggest some areas for further research. First, future research should investigate change in other processes that maintain NSSI. For example, IATs could be designed to investigate other cognitive associations, such as the NSSI-self-punishment association or the NSSI-interpersonal support association. As well, studies examining the association of the DSH IAT D scores with reported or observed consequences of NSSI are likely warranted. Finally, as previously noted, to the best of my knowledge no previous studies have investigated whether individuals who engage in chronic NSSI experience less relief post NSSI than individuals who have engaged in it less frequently. Notably, greater NSSI versatility has been associated with greater clinical severity and suicidality among individuals who engage in NSSI (Anestis et al., 2014; Nock et al., 2006; Turner et al., 2013; Whitlock et al., 2008). One possible explanation for this greater NSSI versatility among individuals with more clinically severe symptoms is that these individuals no longer experience the desired emotion-relieving consequences of one method over time, and thus try to get the effect from another method. For example, individuals may try burning themselves once cutting themselves no longer provides the desired emotional relief. An interesting future line of research could investigate the relationship between NSSI and relief to determine if NSSI does, in fact, lose its emotion-relieving consequences over time.

7.4. Conclusion

BPD is a debilitating disorder associated with a high prevalence of suicide attempts and NSSI (APA, 2013; Black et al., 2004; Gunderson, 2009; Soloff et al., 1994). NSSI is associated with risk for suicide (Klonsky & May, 2015; Muehlenkamp & Gutierrez, 2007; Nock et al., 2006; Stone et al., 1987) and can have long-term negative emotional, interpersonal, and medical consequences (Briere & Gil, 1998; Wilkinson & Goodyer, 2011). With this research I hoped to add to the existing literature on the factors that maintain NSSI over time and specifically investigate the role of emotional relief in NSSI and the utility of the DSH IAT in tracking change in NSSI risk in the context of treatment, among individuals with BPD. Contrary to predictions, lifetime NSSI frequency

and versatility were not associated with the cognitive NSSI-relief association (relative to disgust; i.e., the D scores) beyond self-reported emotion relief motives. As well, the DSH IAT D scores did not decrease over the course of one year from the start of DBT treatment. Finally, models examining what I hypothesized to be a transactional relationship between baseline D scores, change in D scores, and change in NSSI over time were not a good fit for the data. In spite of these unexpected findings, this research makes an important contribution to the literature and highlights new directions for potential research. Future IAT research should investigate other cognitive NSSI associations, such as self-punishment or interpersonal support. As well, the association of the DSH IAT D scores with reported or observed consequences of NSSI should be investigated. Finally, the results of the current study suggest that the relationship between NSSI and relief over time could be a new avenue of investigation.

References

American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: Author.

Anestis, M. D., Khazem, L. R., & Law, K. C. (2015). How many times and how many ways: The impact of number of nonsuicidal self-injury methods on the relationship between nonsuicidal self-injury frequency and suicidal behavior. *Suicide and Life-Threatening Behavior*, *45*(2), 164–177. https://doi-org.proxy.lib.sfu.ca/10.1111/sltb.12120

Black, D. W., Blum, N., Pfohl, B., & Hale, N. (2004). Suicidal behavior in borderline personality disorder: Prevalence, risk factors, prediction, and prevention. *Journal of Personality Disorders*, *18*, 226–239.

Brain, K. L., Haines, J., & Williams, C. L. (1998). The psychophysiology of self-mutilation: Evidence of tension reduction. *Archives of Suicide Research*, *4*(3), 227–242. https://doi-org.proxy.lib.sfu.ca/10.1023/A:1009692507987

Briere, J., & Gil, E. (1998). Self-mutilation in clinical and general population samples: Prevalence, correlates, and functions. *American Journal of Orthopsychiatry*, *68*(4), 609–620. https://doi-org.proxy.lib.sfu.ca/10.1037/h0080369

Brown, M. Z., Comtois, K. A., & Linehan, M. M. (2002). Reasons for suicide attempts and nonsuicidal self-injury in women with borderline personality disorder. *Journal of Abnormal Psychology*, *111*(1), 198–202. https://doi-org.proxy.lib.sfu.ca/10.1037/0021-843X.111.1.198

Cassin, S. E., & von Ranson, K. M. (2005). Personality and eating disorders: A decade in review. *Clinical Psychology Review*, *25*(7), 895-916. doi:10.1016/j.cpr.2005.04.012

Chapman, A. L. (2019). Borderline personality disorder and emotion dysregulation. *Development and Psychopathology,* 1–14. https://doi.org/10.1017/S0954579419000658

Chapman, A. L., & Dixon-Gordon, K. L. (2007). Emotional antecedents and consequences of deliberate self-harm and suicide attempts. *Suicide and Life-Threatening Behavior*, *37*(5), 543–552. https://doi-org.proxy.lib.sfu.ca/10.1521/suli.2007.37.5.543

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*(3), 371–394. https://doi-org.proxy.lib.sfu.ca/10.1016/j.brat.2005.03.005

Crombag, H. S., Bossert, J. M., Koya, E., and Shaham, Y. (2008). Context-induced relapse to drug seeking: a review. *Philosophical Transactions of the Royal Society B. 363*, 3233–3243. doi: 10.1098/rstb.2008.0090

Crowell, S. E., Beauchaine, T. P., & Linehan, M. M. (2009). A biosocial developmental model of borderline personality: Elaborating and extending Linehan's theory. *Psychological Bulletin*, *135*(3), 495-510.

Crowell, S. E., Kaufman, E. A., & Beauchaine, T. P. (2014). A biosocial model of BPD: Theory and empirical evidence. In C. Sharp & J. L. Tackett (Eds.), *Handbook of borderline personality disorder in children and adolescents.* (pp. 143–157). New York, NY: Springer Science + Business Media. https://doi-org.proxy.lib.sfu.ca/10.1007/978-1-4939-0591-1_11

Ellis, T. E., Rufino, K. A., & Green, K. L. (2016). Implicit measure of life/death orientation predicts response of suicidal ideation to treatment in psychiatric inpatients. *Archives of Suicide Research*, *20*(1), 59–68. https://doi-org.proxy.lib.sfu.ca/10.1080/13811118.2015.1004483

Fernández-Montalvo, J., & Echeburúa, E. (2004). Pathological gambling and personality disorders: An exploratory study with the IPDE. *Journal Of Personality Disorders*, *18*(5), 500-505. doi:10.1521/pedi.18.5.500.51326

Gamer, J., Schmukle, S. C., Luka-Krausgrill, U., & Egloff, B. (2008). Examining the dynamics of the implicit and the explicit self-concept in social anxiety: Changes in the Implicit Association Test-Anxiety and the Social Phobia Anxiety Inventory following treatment. *Journal of Personality Assessment*, *90*(5), 476–480. https://doi-org.proxy.lib.sfu.ca/10.1080/00223890802248786

Glenn, C. R., Kleiman, E. M., Cha, C. B., Nock, M. K., & Prinstein, M. J. (2016). Implicit cognition about self-injury predicts actual self-injurious behavior: Results from a longitudinal study of adolescents. *Journal of Child Psychology and Psychiatry*, *57*(7), 805–813. https://doi-org.proxy.lib.sfu.ca/10.1111/jcpp.12500

Goodman, M., Patil, U., Steffel, L., Avedon, J., Sasso, S., Triebwasser, J., & Stanley, B. (2010). Treatment utilization by gender in patients with borderline personality disorder. *Journal of Psychiatric Practice*, *16*(3), 155–163. https://doi-org.proxy.lib.sfu.ca/10.1097/01.pra.0000375711.47337.27

Grant, B. F., Chou, S. P., Goldstein, R. B., Huang, B., Stinson, F. S., Saha, T. D., ... & Ruan, W. J. (2008). Prevalence, correlates, disability, and comorbidity of DSM-IV borderline personality disorder: results from the Wave 2 National Epidemiologic Survey on Alcohol and Related Conditions. *The Journal of clinical psychiatry*, *69*(4), 533-545.

Gratz, K. L. (2001). Measurement of deliberate self-harm: Preliminary data on the Deliberate Self-Harm Inventory. *Journal of Psychopathology and Behavioral Assessment*, *23*(4), 253–263. https://doi-org.proxy.lib.sfu.ca/10.1023/A:1012779403943

Gratz, K. L. (2003). Risk factors for and functions of deliberate self-harm: An empirical and conceptual review. *Clinical Psychology: Science and Practice*, *10*(2), 192–205. https://doi-org.proxy.lib.sfu.ca/10.1093/clipsy/bpg022

Gratz, K. L., Chapman, A. L., Dixon-Gordon, K. L., & Tull, M. T. (2016). Exploring the association of deliberate self-harm with emotional relief using a novel Implicit Association Test. *Personality Disorders: Theory, Research, and Treatment*, *7*(1), 91–102. https://doi-org.proxy.lib.sfu.ca/10.1037/per0000138

Greenwald, A. G., McGhee, D. E., & Schwartz, J. L. K. (1998). Measuring individual differences in implicit cognition: The implicit association test. *Journal of Personality and Social Psychology*, *74*(6), 1464–1480. https://doi-org.proxy.lib.sfu.ca/10.1037/0022-3514.74.6.1464

Greenwald, A. G., Nosek, B. A., & Banaji, M. R. (2003). Understanding and using the Implicit Association Test: I An improved scoring algorithm. *Journal of Personality and Social Psychology*, *85*(2), 197–216. https://doi-org.proxy.lib.sfu.ca/10.1037/0022-3514.85.2.197

Gunderson, J. G., & Links, P. S. (2009). *Borderline Personality Disorder: A Clinical Guide: 2nd (second) Edition*. Arlington, VS: American Psychiatric Publishing.

Haines, J., Williams, C. L., Brain, K. L., & Wilson, G. V. (1995). The psychophysiology of self-mutilation. *Journal of Abnormal Psychology*, *104*(3), 471–489. https://doi-org.proxy.lib.sfu.ca/10.1037/0021-843X.104.3.471

Han, H. A., Olson, M. A., & Fazio, R. H. (2006). The influence of experimentally created extrapersonal associations on the Implicit Association Test. *Journal of Experimental Social Psychology*, *42*(3), 259–272. https://doi-org.proxy.lib.sfu.ca/10.1016/j.jesp.2005.04.006

Harned, M. S., Chapman, A. L., Dexter-Mazza, E. T., Murray, A., Comtois, K. A., & Linehan, M. M. (2008). Treating co-occurring Axis I disorders in recurrently suicidal women with borderline personality disorder: A 2-year randomized trial of dialectical behavior therapy versus community treatment by experts. *Journal of Consulting and Clinical Psychology*, *76*(6), 1068–1075. https://doi-org.proxy.lib.sfu.ca/10.1037/a0014044

Herpertz, S. (1995). Self-injurious behaviour: Psychopathological and nosological characteristics in subtypes of self-injurers. *Acta Psychiatrica Scandinavica*, *91*(1), 57–68. https://doi-org.proxy.lib.sfu.ca/10.1111/j.1600-0447.1995.tb09743.x

Hooley, J. M., Ho, D. T., Slater, J., & Lockshin, A. (2010). Pain perception and nonsuicidal self-injury: A laboratory investigation. *Personality Disorders: Theory, Research, and Treatment*, *1*(3), 170–179. https://doi-org.proxy.lib.sfu.ca/10.1037/a0020106

Joiner, T. E. (2005). *Why people die by suicide*. Cambridge, MA: Harvard University Press.

Kemperman, I., Russ, M. J., & Shearin, E. (1997). Self-injurious behavior and mood regulation in borderline patients. *Journal of Personality Disorders*, *11*(2), 146–157. https://doi-org.proxy.lib.sfu.ca/10.1521/pedi.1997.11.2.146

Kleindienst, N., Bohus, M., Ludäscher, P., Limberger, M. F., Kuenkele, K., Ebner-Priemer, U. W., … Schmahl, C. (2008). Motives for nonsuicidal self-injury among women with borderline personality disorder. *Journal of Nervous and Mental Disease*, *196*(3), 230–236. https://doi-org.proxy.lib.sfu.ca/10.1097/NMD.0b013e3181663026

Kline, R. B. (2011). *Principles and practice of structural equation modeling* (3rd ed.). New York, NY: The Guildford Press.

Klonsky, E. D. (2007). The functions of deliberate self-injury: A review of the evidence. *Clinical Psychology Review*, *27*(2), 226–239. https://doi-org.proxy.lib.sfu.ca/10.1016/j.cpr.2006.08.002

Klonsky, E. D. & Glenn, C. G. (2009) Assessing the functions of non-suicidal self-injury: Psychometric properties of the Inventory of Statements About Self-injury (ISAS). *Journal of Psychopathology and Behavioral Assessment, 31,* 215-219.

Klonsky, E. D. & Olino, T. M. (2008). Identifying clinically distinct subgroups of selfinjurers among young adults: A latent class analysis. *Journal of Consulting and Clinical Psychology, 76*, 22-27.

Klonsky, E. D., & May, A. M. (2015). The Three-Step Theory (3ST): A new theory of suicide rooted in the "ideation-to-action" framework. *International Journal of Cognitive Therapy*, *8*(2), 114–129. https://doi-org.proxy.lib.sfu.ca/10.1521/ijct.2015.8.2.114

Lang, P. J., Bradley, M. M., Cuthbert, B. N. (2008). *International Affective Picture System (IAPS): Affective ratings of pictures and instruction manual. Technical Report A-8.* Gainesville, FL: University of Florida.

Laye-Gindhu, A., & Schonert-Reichl, K. A. (2005). Nonsuicidal self-harm among community adolescents: Understanding the "Whats" and "Whys" of Self-Harm. *Journal of Youth and Adolescence*, *34*(5), 447–457. https://doi-org.proxy.lib.sfu.ca/10.1007/s10964-005-7262-z

Lindholm, T., Bjärehed, J., & Lundh, L.-G. (2011). Functions of nonsuicidal self-injury among young women in residential care: A pilot study with the Swedish version of the inventory of statements about self-injury. Cognitive Behaviour Therapy, 40(3), 183–189. https://doi-org.proxy.lib.sfu.ca/10.1080/16506073.2011.565791

Linehan, M.M. (1982). *Demographic Data Schedule (DDS)*. University of Washington, Seattle, WA, Unpublished work.

Linehan, M. M. (1993). *Cognitive-behavioral treatment of borderline personality disorder*. New York, NY US: Guilford Press.

Linehan, M. M. (2015). *DBT Skills Training Manual.* New York, NY US: Guilford Press.

Linehan, M. M., & Comtois, K. A. (1996) *Lifetime Parasuicide History.* University of Washington, Seattle, WA: Unpublished work.

Linehan, M. M., Armstrong, H. E., Suarez, A., Allmon, D., & Heard, H. L. (1991). Cognitive-behavioral treatment of chronically parasuicidal borderline patients. *Archives of General Psychiatry*, *48*(12), 1060–1064. https://doi-org.proxy.lib.sfu.ca/10.1001/archpsyc.1991.01810360024003

Linehan, M. M., Comtois, K. A., Brown, M. Z., Heard, H. L., & Wagner, A. (2006). Suicide Attempt Self-Injury Interview (SASII): Development, reliability, and validity of a scale to assess suicide attempts and intentional self-injury. *Psychological Assessment*, *18*(3), 303–312. https://doi-org.proxy.lib.sfu.ca/10.1037/1040-3590.18.3.303

Linehan, M. M., Comtois, K. A., Murray, A. M., Brown, M. Z., Gallop, R. J., Heard, H. L., … Lindenboim, N. (2006). Two-Year Randomized Controlled Trial and Follow-up of Dialectical Behavior Therapy vs Therapy by Experts for Suicidal Behaviors and Borderline Personality Disorder. *Archives of General Psychiatry*, *63*(7), 757–766. https://doi-org.proxy.lib.sfu.ca/10.1001/archpsyc.63.7.757

Linehan, M. M., Heard, H. L., & Armstrong, H. E. (1993). Naturalistic follow-up of a behavioral treatment for chronically parasuicidal borderline patients. *Archives of General Psychiatry*, *50*(12), 971–974. https://doi-org.proxy.lib.sfu.ca/10.1001/archpsyc.1993.01820240055007

Linehan, M. M., & Korsland, K. E. (2003) *Dialectical Behavior Therapy Adherence Manual*. Seattle, WA: University of Washington.

Lloyd-Richardson, E. E., Perrine, N., Dierker, L., & Kelley, M. L. (2007). Characteristic and functions of non-suicidal self-injury in a community sample of adolescents. *Psychological Medicine*, *37*(8), 1183–1192. https://doi-org.proxy.lib.sfu.ca/10.1017/S003329170700027X

Loranger, A. W. (1995). *International Personality Disorder Examination (IPDE) Manual.* White Plains, NY: Cornell Medical Center.

Loranger, A. W., Sartorius, N., Andreoli, A., Berger, P., Buchheim, P., Channabasavanna, S. M., … Regier, D. A. (1994). The International Personality Disorder Examination: The World Health Organization/Alcohol, Drug Abuse, and Mental Health Administration international pilot study of personality disorders. *Archives of General Psychiatry*, *51*(3), 215–224. https://doi-org.proxy.lib.sfu.ca/10.1001/archpsyc.1994.03950030051005

McCauley, E., Berk, M. S., Asarnow, J. R., Adrian, M., Cohen, J., Korslund, K., … Linehan, M. M. (2018). Efficacy of dialectical behavior therapy for adolescents at high risk for suicide: A randomized clinical trial. *JAMA Psychiatry*, *75*(8), 777–785. https://doi-org.proxy.lib.sfu.ca/10.1001/jamapsychiatry.2018.1109

Muehlenkamp, J. J. (2005). Self-Injurious Behavior as a Separate Clinical Syndrome. *American Journal of Orthopsychiatry*, *75*(2), 324–333. https://doi-org.proxy.lib.sfu.ca/10.1037/0002-9432.75.2.324

Muehlenkamp, J. J., & Gutierrez, P. M. (2007). Risk for suicide attempts among adolescents who engage in non-suicidal self-injury. *Archives of Suicide Research*, *11*(1), 69–82. https://doi-org.proxy.lib.sfu.ca/10.1080/13811110600992902

Muthén, L.K., & Muthén, B.O. (2017). *Mplus User's Guide. Eighth Edition.* Muthén & Muthén

Neacsiu, A. D., Lungu, A., Harned, M. S., Rizvi, S. L., & Linehan, M. M. (2014). Impact of dialectical behavior therapy versus community treatment by experts on emotional experience, expression, and acceptance in borderline personality disorder. *Behaviour Research and Therapy*, *53*, 47–54. https://doi-org.proxy.lib.sfu.ca/10.1016/j.brat.2013.12.004

Nock, M. K., & Banaji, M. R. (2007). Prediction of suicide ideation and attempts among adolescents using a brief performance-based test. *Journal of Consulting and Clinical Psychology*, *75*(5), 707–715. https://doi-org.proxy.lib.sfu.ca/10.1037/0022-006X.75.5.707

Nock, M. K., Joiner, T. E., Jr., Gordon, K. H., Lloyd-Richardson, E., & Prinstein, M. J. (2006). Non-suicidal self-injury among adolescents: Diagnostic correlates and relation to suicide attempts. *Psychiatry Research*, *144*(1), 65–72. https://doi-org.proxy.lib.sfu.ca/10.1016/j.psychres.2006.05.010

Nock, M. K., & Prinstein, M. J. (2004). A Functional Approach to the Assessment of Self-Mutilative Behavior. *Journal of Consulting and Clinical Psychology*, *72*(5), 885–890. https://doi-org.proxy.lib.sfu.ca/10.1037/0022-006X.72.5.885

Nock, M. K., Joiner, T. E., Jr., Gordon, K. H., Lloyd-Richardson, E., & Prinstein, M. J. (2006). Non-suicidal self-injury among adolescents: Diagnostic correlates and relation to suicide attempts. *Psychiatry Research*, *144*(1), 65–72. https://doi-org.proxy.lib.sfu.ca/10.1016/j.psychres.2006.05.010

Nock, M. K., Park, J. M., Finn, C. T., Deliberto, T. L., Dour, H. J., & Banaji, M. R. (2010). Measuring the suicidal mind: Implicit cognition predicts suicidal behavior. *Psychological Science*, *21*(4), 511–517. https://doi-org.proxy.lib.sfu.ca/10.1177/0956797610364762

Panos, P. T., Jackson, J. W., Hasan, O., & Panos, A. (2014). Meta-analysis and systematic review assessing the efficacy of Dialectical Behavior Therapy (DBT). *Research on Social Work Practice*, *24*(2), 213–223. https://doi-org.proxy.lib.sfu.ca/10.1177/1049731513503047

Polaschek, D. L. L., Bell, R. K., Calvert, S. W., & Takarangi, M. K. T. (2010). Cognitive-behavioural rehabilitation of high-risk violent offenders: Investigating treatment change with explicit and implicit measures of cognition. *Applied Cognitive Psychology*, *24*(3), 437–449. https://doi-org.proxy.lib.sfu.ca/10.1002/acp.1688

Randall, J. R., Rowe, B. H., Dong, K. A., Nock, M. K., & Colman, I. (2013). Assessment of self-harm risk using implicit thoughts. *Psychological Assessment*, *25*(3), 714–721. https://doi-org.proxy.lib.sfu.ca/10.1037/a0032391

Reitz, S., Kluetsch, R., Niedtfeld, I., Knorz, T., Lis, S., Paret, C., … Schmahl, C. (2015). Incision and stress regulation in borderline personality disorder: Neurobiological mechanisms of self-injurious behaviour. *The British Journal of Psychiatry*, *207*(2), 165–172. https://doi-org.proxy.lib.sfu.ca/10.1192/bjp.bp.114.153379

Russ, M. J., Roth, S. D., Lerman, A., Kakuma, T., Harrison, K., Shindledecker, R. D., … Mattis, S. (1992). Pain perception in self-injurious patients with borderline personality disorder. *Biological Psychiatry*, *32*(6), 501–511. https://doi-org.proxy.lib.sfu.ca/10.1016/0006-3223(92)90218-O

Sansone, R. A., & Sansone, L. A. (2011). Substance use disorders and borderline personality: Common bedfellows. *Innovations in Clinical Neuroscience, 8*(9), 10-13.

Soloff, P. H., Lis, J. A., Kelly, T., Cornelius, J., & Ulrich, R. (1994). Self-mutilation and suicidal behavior in borderline personality disorder. *Journal Of Personality Disorders*, *8*(4), 257-267. doi:10.1521/pedi.1994.8.4.257

Stone, M. H., Stone, D. K., & Hurt, S. W. (1987). Natural history of borderline patients treated by intensive hospitalization. *Psychiatric Clinics of North America*, *10*(2), 185–206. Retrieved from https://search-ebscohost-com.proxy.lib.sfu.ca/login.aspx?direct=true&db=psyh&AN=1988-24500-001&site=ehost-live

Teachman, B. A., & Woody, S. R. (2003). Automatic processing in spider phobia: Implicit fear associations over the course of treatment. *Journal of Abnormal Psychology*, *112*(1), 100–109. https://doi-org.proxy.lib.sfu.ca/10.1037/0021-843X.112.1.100

ten Have, M., Verheul, R., Kaasenbrood, A., van Dorsselaer, S., Tuithof, M., Kleinjan, M., & de Graaf, R. (2016). Prevalence rates of borderline personality disorder symptoms: A study based on the Netherlands Mental Health Survey and Incidence Study-2. *BMC Psychiatry*, *16*. Retrieved from https://search-ebscohost-com.proxy.lib.sfu.ca/login.aspx?direct=true&db=psyh&AN=2016-35970-001&site=ehost-live

Tomko, R. L., Trull, T. J., Wood, P. K., & Sher, K. J. (2014). Characteristics of borderline personality disorder in a community sample: Comorbidity, treatment utilization, and general functioning. *Journal Of Personality Disorders*, *28*(5), 734-750. doi:10.1521/pedi_2012_26_093

Tull, M. T., Gratz, K. L., & Weiss, N. H. (2011). Exploring associations between borderline personality disorder, crack/cocaine dependence, gender, and risky sexual behavior among substance-dependent inpatients. *Personality Disorders: Theory, Research, And Treatment*, *2*(3), 209-219. doi:10.1037/a0021878

Turner, B. J., Cobb, R. J., Gratz, K. L., & Chapman, A. L. (2016). The role of interpersonal conflict and perceived social support in nonsuicidal self-injury in daily life. *Journal of Abnormal Psychology*, *125*(4), 588–598. https://doi-org.proxy.lib.sfu.ca/10.1037/abn0000141

Turner, B. J., Layden, B. K., Butler, S. M., & Chapman, A. L. (2013). How often, or how many ways: Clarifying the relationship between non-suicidal self-injury and suicidality. *Archives of Suicide Research*, *17*(4), 397–415. https://doi-org.proxy.lib.sfu.ca/10.1080/13811118.2013.802660

Urcelay, G. P. (2012). Exposure techniques: The role of extinction learning. In P. Neudeck & H.-U. Wittchen (Eds.), *Exposure therapy: Rethinking the model — refining the method.* (pp. 35–63). Springer Science + Business Media. https://doi-org.proxy.lib.sfu.ca/10.1007/978-1-4614-3342-2_4

Whitlock, J., Muehlenkamp, J., & Eckenrode, J. (2008). Variation in nonsuicidal self-injury: Identification and features of latent classes in a college population of emerging adults. *Journal of Clinical Child and Adolescent Psychology*, *37*(4), 725–735. https://doi-org.proxy.lib.sfu.ca/10.1080/15374410802359734

Widiger, T. A., & Frances, A. J. (1989). Epidemiology, diagnosis, and comorbidity of borderline personality disorder. In A. Tasman, R. E. Hales, & A. J. Frances (Eds.), *American Psychiatric Press Review of Psychiatry, Vol. 8* (pp. 8-24). Washington, DC: American Psychiatric Press.

Wilkinson, P., & Goodyer, I. (2011). Non-suicidal self-injury. *European Child & Adolescent Psychiatry*, *20*(2), 103–108. https://doi-org.proxy.lib.sfu.ca/10.1007/s00787-010-0156-y

Young, R., van Beinum, M., Sweeting, H., & West, P. (2007). Young people who self-harm. *The British Journal of Psychiatry*, *191*, 44–49. https://doi-org.proxy.lib.sfu.ca/10.1192/bjp.bp.106.034330

Appendix A.

My Role in the DBT Study

Aside from my own research described in this proposal, I also had a significant role in the larger study from which my data were gathered. I was one of the original research assessors who conducted the initial screening and baseline diagnostic interviews, as well as some of the follow-up interviews. I then moved into the role of assessment team leader at the SFU site, wherein, in addition to my continued research assessor role, I trained and coordinated study assessors, and coordinated SFU assessment team meetings, under the supervision of one of the principal investigators. I also assisted in training CAMH assessors and coordinated assessment team meetings with assessors from both sites. Once I received my master's degree, I was trained in DBT and began working as a research therapist for the study. As I research therapist, I provided individual DBT sessions to participants, co-led DBT skills groups, provided phone coaching as needed, and took part in weekly therapist consult meetings.

Appendix B.

Deliberate Self-Harm Implicit Association Test

Screenshots of the DSH IAT will be provided upon request. To request screenshots, please contact the Psychology Department at Simon Fraser University and ask to be put in touch with the author.