Predicting Violence among Individuals Who Engage in Self-Injury

by

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Abstract

The current study examined factors that may predict violent behaviour toward others among individuals who engage in non-suicidal self-injury (NSSI). Females engaging in NSSI (*n* = 133) were recruited from online forums dedicated to NSSI behaviours. Contextual (i.e., relationship, employment, academic, and economic) and individual (i.e., borderline and antisocial personality features, treatment engagement, trait anger, impulsivity, distress tolerance, alcohol and drug use) risk factors were examined to determine which factors were associated with physical violence toward others in retrospective and prospective analyses. Antisocial personality features were uniquely associated with a history of violent behaviour; however, trait anger uniquely predicted violence over one year. Contextual factors were not significantly associated with violence. These data suggest that stable traits are particularly important in predicting future violence in this sample, and that individuals who engage in NSSI are similar to other, non self-injuring samples in terms of risk factors for violence.

Keywords: Violence; Non-suicidal Self-injury; Risk Factors; Females

Dedication

I would like to dedicate my thesis to those who came before me and had the patience and the kindness to guide me, as well as those who have supported me every step of the way.

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Introduction

Physical violence or aggression, whether directed toward the self or others, has been associated with particular interpersonal styles, personality variables, emotions and characteristics. Research demonstrates that several of these features tend to be common to both behaviours; however, other features appear to be uniquely associated with either interpersonal violence or self-directed violence. For example, both self- and other directed violence have been thought to share underlying features such as impulsivity (Neto & True, 2011), and high levels of impulsivity have been associated with an increased frequency of both behaviours (Carli et al., 2010). In addition, interpersonal features such as a coerciveness have been associated with both aggression toward others and self-injury (Daffern et al., 2010). In terms of specific emotions that may be common to both behaviours, shame that is directed toward the self or others has been theorized to precede both self- or other-directed aggression (Schoenleber & Berenbaum, 2011).

Within specific samples, certain characteristics or vulnerabilities appear to be associated with both interpersonal and self-directed violence. For example, among adults with attention-deficit/hyperactivity disorder, individuals that score higher on scales associated with high emotionality (e.g., quick to react/over-react emotionally) also appear to engage in self- and other-directed aggression (Dowson & Blackwell, 2010). Another study proposed that, for persons with borderline personality disorder, individuals may engage in harmful behaviours such as interpersonal aggression or self-directed violence in order to stimulate endogenous opioid systems that are characterized by decreased receptor sensitivity or are otherwise lacking in opioid numbers (Bandelow, Schmahl, Falkai, & Wedekind, 2010).

Nevertheless, there appear to be several differences between self- and other-directed violent behaviours. Gender, for example, appears to be differentially associated with violence and self-injury. Specifically, previous studies have found that males had higher interpersonal violence scores whereas females achieved higher self-directed violence scores (Sadeh et al., 2011). In addition, specific aspects of emotional disorders such as depression appear to differentiate between self- and other directed violence. For example, research has found that depressive characteristics such as lack of interest and pleasure were significantly positively associated with self-directed violence; however, these symptoms were negatively associated with interpersonal violence (Sadeh, Javdani, Finy, & Verona, 2011).

It is possible that, given the overlap in some of the features of self- and other-directed violence, each of the behaviours may share core vulnerabilities that make people susceptible to both types of violence. Previous research and review papers examining the association of self-injury with interpersonal violence have demonstrated associations ranging from weak to strong (Daffern & Howells, 2009; Hillbrand, 2001; Maden, Chamberlain, & Gunn, 2000). For example, approximately half of a sample of violent forensic psychiatric inpatients engaged in self-injurious behaviour (Hillbrand, 1995). In addition, also among forensic psychiatric inpatients, a proportion of individuals who engaged in self-injury also engaged in minor to serious interpersonal aggression while in custody (Hillbrand, Krystal, Sharpe, & Foster, 1994; Hillbrand, Young, & Krystal, 1996), and many had a history of violent behaviour (e.g., up to 90% of those engaging in self-injury; Hillbrand et al., 1996). Further, among both adolescent and adult incarcerated samples, individuals who engage in self-injury have been found to engage in more assaultive behaviour and receive more assault charges during their period of incarceration than individuals who do not engage self-injury (Chowanec, Josephson, Coleman, & Davis, 1991; Jones, 1986). Indeed, some authors have suggested that incarcerated individuals with a history of self-injurious behaviour, among several other risk factors, may pose a high risk of reoffending violently against the public (Wood, 2007). Finally, among a sample of “habitually violent” incarcerated males (n=22), 37% were found to evidence scars resulting from self-injurious behaviours (Bach-y-Rita, 1974).

Despite the growing emphasis in the literature on the distinction between non-suicidal (NSSI) and suicidal (suicide attempts) forms of self-injury, studies of self-injury among forensic samples have used varying definitions, with some including suicidal behaviour under this umbrella, whereas others distinguish between suicide attempts and NSSI. Regarding the literature on violence risk more generally, current theories or models focused on explaining the association between violence toward others and self-directed violence focus primarily on suicidal behaviours (e.g., Hillbrand, 2001), or use rating scales (e.g., Overt Aggression Scale) or interview procedures that do not differentiate between self-injurious behaviours that are done with the intent to kill oneself and those without such intent (e.g., Daffern & Howells, 2009; Hillbrand et al., 1994; Hillbrand et al., 1996). As such, despite the reported association between self-injury and violent behaviour towards others (Hillbrand, 2001; Maden et al., 2000; Daffern & Howells, 2009), it is unclear what factors may contribute to violence toward others for

individuals who engage in non-suicidal self-injury. Indeed, there is currently a lack of research at present that specifically examines characteristics and risk factors for violence among individuals who engage in both NSSI and violence toward others, particularly in terms of prospective analyses. As such, the purpose of the present study is to examine the factors that may be associated with and predict violent behaviour among individuals who engage in NSSI.

Factors Associated with NSSI and Violence

Following an examination of the literature on violence risk more generally and, to the extent available, literature regarding violence within NSSI groups, and it appears that both contextual (e.g., economic status, employment difficulties, relationship difficulties, etc.) and individual (e.g., anger, impulsivity, substance use, etc.) factors are associated with increased risk for violence. Indeed, previous authors in the area of violence risk assessment have highlighted the importance of investigating more than just individual factors when assessing risk for violence; an individual's environmental context, or the context in which violence occurs, is often just as important in determining risk or likelihood of violent behaviour as personality characteristics or other individual factors (Grisso, 2003).

Contextual Factors

Economic status and employment difficulties. Research examining correlates of violence have often considered socioeconomic factors such as the association of income level of groups or individuals and risk for violent victimization or perpetration (Babu & Kar, 2010; Chermack, Fuller & Blow, 2000; Cunradi, Caetano, & Schafer, 2002; Ludwig, Duncan, & Hirschfield, 2001). In addition, the association between economic or income level and risk for violence perpetration has been examined both in terms of general community violence and domestic or intimate partner violence, as well as across many diverse countries, cultures, and ethnicities. For example, one study of intimate partner violence in African American, Hispanic, and Caucasian couples in the United States found that gross annual family income level was strongly associated with the likelihood of intimate partner violence across all three ethnicities (Cunradi et al., 2002). Similarly, another study examining domestic violence (physical, psychological, and sexual) in Eastern India found that monthly family income was significantly negatively associated with all types of domestic violence, and the authors suggested that high family income may be a protective factor against domestic violence (Babu & Kar, 2010). Conversely, other studies in the United States have found that annual household income

was a significant negative predictor of non-partner violence, but not intimate partner violence, and that individuals from low-income households were more likely to engage in general violence than high-income households (Chermack et al., 2000). Finally, individuals living in low-income housing or high-poverty neighbourhoods also appear to engage in higher rates of violence. For example, an experimental study that involved relocating low-income families to residential areas with less poverty resulted in a significant reduction in violent crime for adolescents (Ludwig et al., 2001). In addition, another study examining aggression among elementary school boys and girls found that family income was associated with aggression in the first grade and that the neighbourhood factors, including the economic status of the neighbourhood, were associated with the pattern of aggressive behaviours over time for both males and females (Vanfossen, Brown, Kellam, Sokoloff, & Doering, 2010).

Employment difficulties tend to be associated with low economic status or income, and many studies tend to group the two factors together in their analyses and discussions of risk for violence. Among studies that have analyzed these factors separately, unemployment status has been associated with risk for both general violence (Gatti, Tremblay, & Schadee, 2007; Zagar, Busch, Grove, Hughes, & Arbit, 2009) and intimate partner aggression (O'Leary, Tintle, Bromet, & Gluzman, 2008). Moreover, previous studies have found unemployment status, among other variables, to significantly distinguish between adolescents who engaged in homicidal behaviour and adolescents who did not engage in violence (Zagar et al., 2009).

Academic achievement. Previous studies have also examined the association of educational achievement and violence perpetration. Lower education levels have been associated with violence perpetration among adult forensic inpatient samples (Hoptman, Yates, Patalinjug, wack, & Convit, 1999). Moreover, longitudinal studies examining predictors of adolescent and adult aggressive behaviour found that low academic achievement predicted adolescent aggression and violent behaviour as well as adult convictions for violence (Farrington, 1989; Swahn & Donovan, 2004). Among Asian American and Pacific Islander adolescents, high academic achievement has also been characterized as a protective factor against several forms of violence, such as throwing objects at others, robbery, "attacking someone with the intention of hurting or killing them" and involvement in "gang fights," (Wegner, Garcia-Santiago, Nishimura, & Hishinuma, 2010, p. 796). In a study examining female and male offenders, female

violent offenders were found to have lower levels of education than male offenders, and were less likely to have prior employment (Rossegger et al., 2009).

Relationship difficulties. Difficulties with intimate relationships, or relationship instability, have been characterized as risk factors for violent behaviour, both in terms of general violence (Webster, Douglas, Eaves, & Hart, 1997) as well as intimate partner violence (Kropp, Hart, Webster, & Eaves, 2008). For example, studies have examined the pathways or trajectories preceding intimate partner violence and found that couples reported various forms of relationship conflict such as "yelling, disparaging, intimidating and rejecting one's partner" prior to the act of violence (Horwitz, Santiago, Pearson, & LaRussa-Trott, 2009, p. 253). Moreover, difficulties with establishing intimate relationships have also been associated with violence perpetration. Indeed, previous studies have shown that marriage may be a protective factor for certain types of violence in that married men were less likely to report engaging in sexual assaults than cohabitating men or men who reported "other" as their marital status (Stander, Merrill, Thomsen, Crouch, & Milner, 2008). In addition, in terms of general violence, those who reported being "never married" were more likely to engage in violent behaviour than married, divorced or separated men (Klassen & O'Connor, 1988).

Individual Factors

Personality disorders. Previous research in the area of violence risk assessment has consistently noted the strong association of personality disorders with violence (Rabkin, 1979; Lussier, Verdun-Jones, Deslauriers-Varin, Nicholls, & Brink, 2010). Moreover, the presence of a personality disorder is often considered to be a risk factor for future violent behaviour (Webster et al., 1997; Douglas & Kropp, 2002). In particular, antisocial personality disorder (ASPD) has a robust relationship with violent behaviour (Meloy, 1995; Bonta, Law, & Hanson 1998; Lussier et al., 2010), and violent or aggressive behaviours toward others comprise one of the criteria for a diagnosis of ASPD in the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition – Text Revision [DSM-IV-TR; American Psychiatric Association (APA), 2000]. A meta-analysis of longitudinal studies by Bonta and colleagues (1998) found that a diagnosis of ASPD was the strongest personality predictor of general and violent recidivism. In addition, antisocial or negative attitudes are also considered to be risk factors for violence (Webster et al., 1997); thus, even without a diagnosis of ASPD, the presence of antisocial or negative attitudes may place an individual at a higher risk for engaging in violence toward others.

Another personality disorder that has been associated with violence toward others is Borderline Personality Disorder (BPD). One criterion for a diagnosis of BPD outlined in the DSM-IV-TR (APA, 2000) is intense anger or difficulty controlling anger, which may be manifested by repeated acts of violence or aggression toward others. In addition, experimental studies have demonstrated that individuals with BPD engage in more aggressive behaviours and score higher on measures of hostility than individuals without BPD (Dougherty, Bjork, Huckabee, Moeller, & Swann, 1999). Previous studies have also indicated moderate rates of co-occurrence (14.3%) of ASPD and BPD (Soloff, Lis, Kelly, Cornelius, & Ulrich, 1994), and the two disorders have overlapping features, particularly in the area of impulsivity. Therefore, it is possible that BPD features may be associated with violent behaviour among a sample of individuals who engage in NSSI.

Anger. Trait levels of specific emotions such as anger have been noted as important risk factors in the assessment and prediction of violent behaviour (Novaco, 1994; Cornell, Peterson, & Richards, 1999). For example, previous research has found that scores on a measure of anger were predictive of future aggression while incarcerated, but were not significantly associated with a history of violence or aggressive behaviour (Cornell et al., 1999). In addition, one model of anger expression suggests that outwardly expressed anger should be associated with aggressive behaviours, whereas inwardly expressed and controlled anger may not be associated with aggression towards others (Spielberger, 1999). In terms of violence risk assessment, anger has also been found to predict community violence (Monahan et al., 2000), and an inability to control angry reactions and behaviours is considered to be a risk factor for engaging in violent behaviour (Webster et al, 1997).

High levels of anger have also been associated with NSSI (Guertin, Lloyd-Richardson, Spirito, Donaldson, & Boergers, 2001). For example, high levels of anger, and anger that is specifically directed toward the self, have often been reported as antecedents of self-injurious behaviour (Laye-Gindhu & Schonert-Reichl, 2005; Klonsky, 2007). Individuals who engage in NSSI also tend to have a higher level of discomfort associated with their anger, as well as greater difficulties controlling their anger (Laye-Gindhu & Schonert-Reichl, 2005). Thus, anger may be a significant predictor of violent behaviour especially for individuals who engage in NSSI.

Impulsivity. High levels of impulsivity have been associated with violent or aggressive behaviour toward others (Berkowitz, 2008; Edwards, Scott, Yarvis, Paizis, & Panizzon, 2003; Fehon, Grilo, & Lipschitz, 2005), and many researchers classify or

define violent behaviours as being either intentional and calculated or primarily impulsive in nature (Baratt, Stanford, Kent, & Felthous, 1997; McDermott, Quanbeck, Busse, Yastro, & Scott, 2008); thus, impulsivity may play an central role in the perpetration of some violent behaviours. In addition, in several well-validated and frequently used guides for assessing risk for violence (e.g., HCR-20; Webster et al., 1997), impulsivity is included as a stand-alone item, and therefore independently contributes to the overall risk assessment and prediction of risk for future violence. Moreover, in one study of adolescent males, findings indicated that early impulsivity remained a significant predictor of later violent behaviour even when early drug use and early violent behaviour were statistically controlled for (White, Loeber, Stouthamer-Loeber, & Farrington, 1999). Impulsivity has also been shown to be an important risk factor when assessing risk for violent recidivism (Douglas, Epstein, & Poythress, 2008). Finally, individuals with a history of NSSI tend to report engaging in more impulsive behaviour (Herpertz, Sass, & Favazza, 1997) and demonstrate more impulsive behaviour in laboratory tasks than individuals who do not engage in NSSI (Glenn & Klonsky, 2010). Thus, impulsivity may significantly predict violent behaviour among individuals who engage in NSSI.

Substance use. Previous research has demonstrated a strong association between substance use and violent behaviour. For example, previous longitudinal studies have found that early use of substances such as marijuana and alcohol predicts later violent behaviour (White et al., 1999). In addition, a diagnosis of substance use disorder has been associated with chronic engagement in violence (i.e., 15 or more episodes of violence) in a psychiatric inpatient sample (Lussier et al., 2010). Similar to impulsivity, substance misuse is considered to be an important risk factor for violent behaviour (Monahan et al., 2000; Douglas & Kropp, 2002), and is included as a stand-alone item in a frequently used violence risk assessment guide (i.e., HCR-20; Webster et al., 1997). In addition, alcohol misuse specifically has been shown to be related to engagement in violent behaviours, and is also included as a stand-alone item in an actuarial risk assessment for the prediction of violent behaviour (i.e., Violence Risk Appraisal Guide; Harris, Rice, & Quinsey, 1993). Thus, it appears that the use or abuse of substances places an individual at a higher risk for engaging in future violent behaviours. Furthermore, individuals who engage in self-injury are also more likely to engage in substance use than individuals who do not engage in self-injury (Langbehn & Pfohl, 1993). Therefore, among a sample of individuals who engage in NSSI, substance

abuse may significantly predict whether an individual is likely to engage in violent behaviour toward others.

Treatment non-compliance. Refusal to engage in treatment, low treatment motivation, treatment dropout and other forms of treatment non-compliance has been associated with risk for violent recidivism. A previous meta-analysis on factors related to treatment compliance and subsequent criminal recidivism found that across diverse treatment programs (e.g., sexual offender, domestic and general violence, and general correctional treatment programs) treatment dropout was associated with violent recidivism (Olver, Stockdale, & Wormith, 2011). In addition, one meta-analytic study examining factors associated with non-completion or dropout from intimate partner violence treatment programs found that the variables examined (e.g., employment status, marital status, income, etc.) are similar to factors that have been associated with recidivism of intimate partner violence (Jewell & Wormith, 2010). The factors examined in this study also appear to overlap with several of the factors identified above as risk factors for engaging in intimate partner as well as general violence. As such, it appears that non-compliance with treatment, and the factors associated with treatment non-compliance, may place an individual at higher risk for engaging in violent behaviour.

Distress intolerance. Distress tolerance has been conceptualized as an ability to tolerate emotional arousal (Chapman, Gratz, & Brown, 2006). A lack of distress tolerance has been thought to contribute to NSSI (Chapman et al., 2006; Klonsky, 2007). For example, in laboratory studies, individuals who engage in NSSI appear to be less able or willing to experience prolonged emotional arousal associated with a distressing task and consequently quit the task sooner than individuals who do not engage in NSSI (Nock & Mendes, 2008). Several authors have also suggested that treatments for aggressive or violent behaviours should include training on distress tolerance skills (Berzins & Trestman, 2004; Fruzzetti & Levensky, 2000); however, few studies have empirically tested the relationship between violence or aggression toward others and distress tolerance. Therefore, it is unclear whether violent individuals do in fact demonstrate lower levels of distress tolerance in laboratory settings, or whether, on average, this group would score lower on self-report measures assessing distress tolerance. Nevertheless, due to its robust association with NSSI and its proposed relationship with violent behaviours, it is possible that distress intolerance may be associated with violent behaviour among a sample of individuals who engage in NSSI.

Summary

In sum, previous research supports an association of NSSI with violent behaviour toward others and suggests the presence of a subgroup of individuals who engage in NSSI that also engage in violence (Hillbrand, 2001; Maden et al., 2000; Daffern & Howells, 2009). Nonetheless, not everyone who engages in NSSI will engage in violent behaviour toward others and, at present, it is unclear what characteristics may distinguish these subgroups of individuals, or what factors may predict violent behaviour over time. Regarding contextual factors, economic status (Chermack et al., 2000; Cunradi et al., 2002; Vanfossen et al., 2010) and academic achievement (Hoptman et al., 1999; Farrington, 1989; Swahn & Donovan, 2004), as well as relationship (Saunders, 1992; Webster et al., 1997) and employment (Gatti et al., 2007; Zagar et al., 2009; O'Leary et al., 2008) difficulties have been associated with violent behaviour. In terms of individual factors, previous work has found that ASPD features are associated with violent or aggressive behaviour toward others (Meloy, 1995), and some authors have suggested an association between antisocial personality features and NSSI behaviours (Virkkunen, 1976). In addition, treatment non-compliance has also been associated with risk for violence in that individuals who are unwilling or fail to engage in treatment programs are more likely to engage in future violence (Olver et al., 2011). Moreover, BPD features, anger, impulsivity, substance use and low distress tolerance have been associated with both NSSI (Klonksy et al., 2003; Stanley, Gameroff, Michalsen, & Mann, 2001; Herpertz et al., 1997; Guertin et al., 2001; Laye-Gindhu & Schonert-Reichl, 2005; Klonsky, 2007) and violence toward others (Dougherty et al., 1999; Berzins & Trestman, 2004; Fruzzetti & Levensky, 2000; Berkowitz, 2008; Edwards et al., 2003; Fehon et al., 2005; Novaco, 1994; Cornell et al., 1999).

Due to their aforementioned associations with both NSSI and violence toward others, perhaps among individuals who engage in NSSI, factors that increase the likelihood that individuals will engage in violence towards others are likely to include both contextual (i.e., economic status, academic achievement, relationship and employment difficulties) and individual (i.e., high levels of antisocial and borderline personality disorder features, anger, impulsivity, substance use, treatment non-compliance and low distress tolerance) factors.

Primary Aims

The primary aims of the present study were twofold: to examine, 1) what factors distinguish violent from non-violent self-injurers, and 2) what factors predict the occurrence of violence toward others among self-injurers. To examine these aims, a

multi-pronged data analytic approach was taken in which several phenomena related to violence risk were examined. Specifically, factors were examined in terms of whether they predicted the occurrence of violence (i.e., yes/no), were associated with increased risk for violence, and whether they predicted time to violent behaviour. This approach was taken to provide the most comprehensive test of the following hypotheses: Hypothesis 1a: Contextual factors such as economic status, academic achievement, relationship and employment difficulties will be significantly associated with history of violence toward others in a sample of individuals who engage in NSSI. Hypothesis 1b: Individual factors such as ASPD and BPD features, high levels of anger, impulsivity, substance use, treatment non-compliance and low distress tolerance will be significantly associated with history of violence toward others. Hypothesis 2a: Both contextual and individuals factors will prospectively predict whether self-injurers will engage in violence toward others over a one-year period. Hypothesis 2b: Contextual and individual variables will significantly affect the rate at which violence occurs following the baseline assessment and over the one-year follow-up period. Hypothesis 2c: Contextual and individual variables will predict violence over the one-year period at better than chance levels. In addition, because previous research has demonstrated that individuals who engage in more frequent NSSI are more likely to engage in violence (Hillbrand et al., 1996; Ireland, 2000) than individuals who engage in less frequent self-injury, another goal of the present study was to examine whether frequency or number of methods (e.g., cutting, burning, head banging, etc.) of NSSI is associated with a history of violence toward others, or whether these factors significantly predict violence toward others over a one-year period. Hypothesis 3a then, is that a history of engagement in NSSI, as measured by frequency and diversity of methods of NSSI, will be significantly associated with a history of violence and will prospectively predict violent behaviour over a one-year period.

The present study will focus primarily on physically *violent* behaviours, using the definition of violence outlined in the HCR-20 (“actual, attempted, or threatened harm to a person or persons”, p. 24; Webster et al., 1997), a widely used guide for assessing violence risk.

Methods

Participants

The data used in the present investigation have previously been collected as part of a larger longitudinal study examining NSSI behaviours over time. Participants in the

current study (*n* = 133 females, *n* = 12 males) were recruited from online chat and social networking groups related to self-injury, such as Dailystrength.org and LiveJournal.com. Due to the small number of males in the current study, males were excluded from all subsequent analyses. All participants in the current study reported engaging in NSSI in the past. Participants (*n* = 133) were aged 16 to 54 (*M* = 23.17, *SD* = 6.71), and 97% described their ethnicity as White or Eastern European (*n* = 125, 94%) and Asian (*n* = 4, 3%). The majority of participants reported their country of residence as the United States (*n* = 64, 48.3%), Canada (*n* = 23, 17.3%) and the United Kingdom (*n* = 19, 14.6%), and a large proportion reported their familial income as less than $35,000 (*n* = 48, 36.1%). Many of the participants in the current sample reported currently attending college or university (*n* = 63, 47.4%) or having completed a university degree (*n* = 23, 17.3%; please see Table 1 for demographic characteristics).

Procedures

To recruit participants, the administrators of the online chat and social networking groups were contacted and provided with a link to a secure web page containing information about the study. The administrators then informed group members of this link, and group members voluntarily consented to follow the link. Once participants followed the link, they were directed to an informed consent page. To participate in this study, participants selected a box indicating their consent and responded to three questions regarding the content of the informed consent form to ensure they have read and understood the form. We also provided a list of frequently asked questions and answers as well as contact information for any participant who wished to ask further questions before participating in the study. As the on-line nature of the study made it difficult to provide actual monetary compensation, participants were offered a choice of gift certificates (e.g., Amazon.com or PayPal.com) valued at $5 CAD that they may use for online purchases.

Participants completed several self-report questionnaires online by selecting or providing typed responses to various questions. Specifically, participants completed questionnaire measures of NSSI, violence, life experiences such as relationship and employment difficulties, treatment engagement, impulsivity, distress tolerance, anger, substance use, personality features, and demographic information, such as income level and academic achievement (i.e., level of schooling attained, including high-school, post-secondary diplomas, post-secondary degrees, etc.). The measures took approximately two hours to complete and were followed by a positive emotion induction in which

participants were asked to describe a moment in their life when they felt both proud of themselves and happy. To manage any psychological risks that may result from the experience of filling out these questionnaires, participants were provided with contact information for several international crisis hotlines.

The current study received approval to use secondary data from the principal investigator of the larger study as well as from the Director of the Office of Research Ethics at Simon Fraser University, on behalf of the Research Ethics Board. A research grant from the Social Sciences and Humanities Research Council of Canada funded the larger longitudinal study.

Measures

NSSI. The Questionnaire for Non-Suicidal Self-Injury (QNSSI; Schmahl, Bohus, Stieglitz & Reicherzer, 2008; developed for Kleindienst et al., 2008) was used to assess NSSI behaviours. The QNSSI measures the frequency, severity, and methods of NSSI employed, as well as expectations and feelings related to self-harming behaviour. Although this measure assesses a range of characteristics associated with NSSI, for the purposes of the present study, the main variables of interest were the frequency and number of methods of NSSI behaviours.

Violence perpetration. Perpetration of violence toward others (defined specifically as physical violence toward others) was assessed using a self-report questionnaire developed from the MacArthur Community Violence Instrument (MACVI; Monahan & Steadman, 1994). The MACVI is a 9 item measure in which participants respond “yes” (score of 1 for that item) or “no” (score of 0 for that item) to questions regarding their engagement in a variety of physically violent behaviors toward others over their lifetime, ranging in severity from throwing objects at someone, to using a knife or firing a gun at someone. In addition, participants are asked to indicate their relationship with the victim of their violence (e.g., partner, acquaintance, relative, or stranger). The MACVI was developed using a community sample and has been used in previous studies assessing self-reported violence (McNiel, Eisner, & Binder, 2000). Moreover, the MACVI has demonstrated reliability and validity in studies of violence in psychiatric samples (Steadman, et al., 1998). In the present study, the primary variable of interest is whether an individual has engaged in physically violent behavior towards another person. To measure physical violence perpetration, scores (i.e., 0 or 1) across items 1 to 9 were summed, and a dichotomous variable was created with scores equal

to or greater than 1 indicating history of violent behavior (coded as a 1), and scores of 0 indicating no history of violent behavior (coded as a 0).

Relationship and employment difficulties. Difficulties in intimate relationships and employment problems were assessed using the Life Experiences Survey (LES; Sarason, Johnson, & Siegel, 1978). The LES was designed to assess positive and negative life experiences occurring within the past year, as well as the impact of these events on a 7-point scale ranging from -3 to +3. The LES has demonstrated adequate test-retest reliability as well as construct validity (Sarason et al., 1978). For the purposes of the present study, the primary relationship variables of interest are the mean ratings across the "marital separation from mate (due to conflict)" and "breaking up with boyfriend/girlfriend" items, and the primary employment variables of interest are the mean ratings of the "trouble with employer (in danger of losing job, being suspended, demoted, etc.)" and "being fired from job" items. In the present study, the internal consistency for the employment variables was quite high (α = .98), and the internal consistency of the relationship variables was very good (α = .89).

Treatment non-compliance. Treatment engagement was assessed using one question from the Treatment History Interview (THI; Linehan, 1987): "What percentage of treatment recommendations do you follow? (That is, how often do you do what your treatment providers suggest?)". Participants rated their compliance in treatment on a scale ranging from 1 to 7, corresponding to percentage ranges from "0-20%" to "90-100%".

Anger. Overall anger levels were assessed using the State-Trait Anger Expression Inventory-2 (STAXI-2; Spielberger, 1999). The STAXI-2 contains 57 items with 6 scales and 5 subscales, and each item is rated on a Likert-type scale ranging from 1 ("almost never") to 4 ("almost always"). Trait anger scores (T-ANG) are assessed by summing scores across 10 trait anger items (total scores ranging from 10 to 40), and have demonstrated good internal consistency in community samples (α = .84 to .86; Spielberger, 1999). The state anger scale was not used in the present study. Missing data on this measure were dealt with by prorating scores for each scale and, if more than 2 items were missing on a scale, the scale scores were not calculated.[1] Prorated

[1] The STAXI-2 test manual (Spielberger, 1999) suggests dealing with missing data by inserting the mean of the trait anger scale (2.0) for the missing items on that scale. For the current project, I decided to prorate missing data rather than use the method suggested in the manual to avoid entering data into the dataset that the participants did not provide. Data were analyzed using both methods and the results were essentially the same.

scores were calculated for five participants, and one participant did not answer at least 8 of the trait anger items, and thus, a total score was not computed for this person. Prorated total scores were used in subsequent analyses for individuals who had completed at least 8 of the STAXI-2 trait anger items. The internal consistency of the trait anger scale in the current sample was good (α = .89).

Personality features. Borderline and antisocial personality features were assessed using the Personality Assessment Inventory Borderline and Antisocial scales (PAI-BOR and PAI-ANT, respectively; Morey, 1991). The PAI is a 344 item self-report measure of personality and mental health with two scales assessing personality features associated with a diagnosis of borderline or antisocial personality disorder as outlined in the DSM-IV-TR (APA, 2000). Responses on the PAI are rated on a 3-point Likert-type scale ranging from 0 (“false”) to 3 (“always”) indicating the degree to which a particular statement is true for an individual. The PAI-BOR scale is comprised of 24 items that can be summed to yield a total score, and scores on the 4 subscales of the PAI-BOR may also be calculated (affective instability, identity problems, negative relationships, and self-harm). The PAI-BOR total scale scores (α = .93) and subscale scores (α = .53 to .76) have demonstrated low to high internal consistency in previous studies (Chapman, Dixon-Gordon, Layden, & Walters, 2010; Werner & Crick, 1999). The PAI-ANT contains 24 items that comprise 3 subscales (antisocial behaviours, egocentricity, and stimulus seeking). The total and subscale scores on the PAI-ANT have demonstrated good internal consistency in previous studies (α = .70 to .73; Werner & Crick, 1999). There were no missing data for the PAI-BOR or PAI-ANT scales in the current sample and total scores were used for subsequent analyses. Both the PAI-BOR (α = .84) and PAI-ANT (α = .88) scales demonstrated good internal consistency in the current sample.

Distress intolerance. The Distress Tolerance Scale (DTS; Simons & Gaher, 2005) was used to assess distress intolerance. The DTS is a 15 item self-report questionnaire that assesses the capacity to endure negative psychological states. Each item is rated on a 5-point Likert-type scale ranging from 1 (“strongly agree”) to 5 (“strongly disagree”). Total scores range from 15 to 75, with lower scores indicating that distress is perceived as intolerable. This measure has demonstrated high internal consistency in previous studies (α = .91; Anestis, Selby, Fink, & Joiner, 2007). Prorated total scores on the DTS were used in subsequent analyses for participants who had completed at least 80% (n = 12) of the 15 items. A total score was not computed for one person as a result of her not completing at least 12 of the 15 items, and prorated scores

were calculated for five people who did not complete one or two items. Total scores for the DTS in the current sample demonstrated excellent internal consistency (α = .91).

Impulsivity. Impulsive behaviour was assessed using the Barratt Impulsiveness Scale – 11 (BIS-11; Patton, Stanford, & Barratt, 1995). The BIS-11 is a 30 item self-report instrument designed to assess the personality and behavioural aspects of the construct of impulsiveness. The BIS-11 is composed of 9 scales that measure the attentional or cognitive, motor, and non-planning facets of impulsivity, and each item is rated on a 4-point Likert-type scale ranging from 1 ("absent") to 4 ("most extreme"). The non-planning scale items are reverse scored so that higher scores indicate higher impulsivity. Total scores are obtained by summing the scores on each item (range = 30 to 120). The BIS-11 has been shown to reliably measure impulsivity in clinical and non-clinical samples (Patton et al., 1995). Prorated total scores were used in subsequent analyses for participants who had completed at least 80% (n = 25) of the 30 items. Two participants completed less than 25 of the 30 BIS-11 items, and thus, total scores were not computed for these participants. Prorated scores were calculated for 14 participants who did not complete one or two items. The BIS-11 total scores in this sample demonstrated good internal consistency (α = .84)

Substance abuse. Substance abuse was assessed using the Addiction Severity Index – self-report version (McLellan, Luborsky, O'Brien, & Woody, 1980; McLellan et al., 1992; Rosen, Henson, Finney & Moos, 2000). The self-report ASI assesses problems associated with substance use, including: alcohol use, drug use, legal, medical and employment difficulties, family/social problems, and psychiatric symptoms. For the purposes of the present study, the main variables of interest were alcohol and drug use. The ASI includes items such as "how many days did you drink alcohol to intoxication in the past 30 days," "in the past 30 days, how many days have you experienced drug problems," and "how important to you now is treatment for these alcohol[drug] problems?" Scoring procedures for the self-report ASI were conducted according to the suggestions outlined in McGahan, Griffith, Parente, & McLellan (1986). To create a composite score, each item was divided by the highest score possible for that item, and then means across all items relevant to the variables of interest were calculated. Thus, each composite score ranges from 0 (few problems endorsed) to 1 (many problems endorsed). The ASI self-report version has demonstrated adequate internal consistency for alcohol and substance use composite scores in previous studies (α > .77). In the

current sample, both the ASI drug use (α = .75) and alcohol use (α = .81) items demonstrated adequate to good internal consistency.

Data Analytic Approach

Data Preparation

Prior to conducting Pearson Product Moment Correlations to determine whether the independent variables (IVs) are significantly associated with the dependent variable (DV; perpetration of physical violence), box plots were examined for the presence of any outliers, and if any outliers were present, log (base10) transformations were conducted. Next, descriptive statistics (e.g., mean, standard deviation, skew, and kurtosis) and internal consistency for all measures were checked. Finally, the association of potential covariates (e.g., age, history of violence, frequency of NSSI) with future violent behaviour were examined, and the variables significantly associated with future violent behaviour were statistically controlled for by inclusion in the first step of the hierarchical logistic regression analyses.

Prior to conducting the logistic regression analyses, the data were examined for the presence of any outliers and influential points using: Cook's Distance and *DFBETA's* with a cut-off of distances greater than 1.0 as per Cohen, Cohen, West, and Aiken (2003). Next, the assumption of normality of the distribution of the residuals was investigated by examining normal q-q plots of the standardized residuals. Finally, the Tolerance (acceptable values > .10) and Variance Inflation Factor (VIF; acceptable values < 10; Cohen et al., 2003) values were examined to determine whether considerable multicollinearity among the predictor variables is affecting the prediction of the regression coefficients.

Prior to conducting the Cox regression analyses, the assumption of proportional hazards was examined by plotting the *DFBETA* against the participant identification number. If it was found that this assumption had been violated, the limits of this model were described accordingly.

Data Analysis. First, to examine hypotheses 1a and 1b, bivariate correlations among each set or family of variables (i.e., contextual and individual) were examined to evaluate whether the independent variables (IVs) were significantly associated with the dependent variable (DV; history of physical violence perpetration). A Bonferroni correction was used to control for the probability of making a Type-I error when conducting the above correlational tests for each family of tests (i.e., the per-test alpha

rate was set to .01 for the analysis of contextual variables, and .006 for the analysis of individual variables).

Next, each of the significant IVs among the contextual and individual variables were added to separate logistic regression analyses to determine whether any of the IVs significantly predicted group membership (i.e., physically violent vs. not physically violent toward others) in the current sample of self-injuring individuals. For the purposes of the regression analyses, each of the variables were transformed to z-scores so that they were centred around the same mean prior to conducting the analyses. Identified covariates were added into the model in the first step for each hierarchical regression analysis. In the second step, significant IVs were added to their respective models. Specifically, adjusted OR's were examined to assess the unique predictive power of each IV, controlling for all other predictors in the model.

To examine hypothesis 2a, predicting the occurrence of violence within a one-year period following the baseline assessment, bivariate correlations among each set of variables were first examined to evaluate whether the IVs were significantly associated with the DV (perpetration of physical violence within one year following baseline assessment) using the Bonferroni correction outlined in hypotheses 1a and 1b above. Next, two separate logistic regression analyses were conducted for the contextual and individual variables. Identified covariates were again added in the first step of the hierarchical logistic regression analyses. In the second step, the IVs that were found to be significantly associated with violence over time at the bivariate level were added to their respective models. Adjusted OR's were examined to assess the unique predictive power of each IV, controlling for all other predictors in the model.

To examine hypothesis 2b, survival analysis techniques, specifically the Cox proportional hazards model, will be employed to examine the effect that the IVs have on the hazard function. Each of the IVs that were significantly associated with violence over time in the correlation analyses for both contextual and individual variables in hypothesis 2a were added to the their respective Cox regression models. Adjusted OR's were examined to assess which IVs had an effect on the hazard function resulting in an increase or decrease in the hazard rate, controlling for all other predictors in the model.

To examine hypothesis 2c, the area under the curve (AUC) of a receiver operating characteristic (ROC) analysis was examined to determine the predictive utility of the IVs from hypothesis 2a. ROC curves consist of a plot of the true positive rate (sensitivity) against the false positive rate (one minus specificity). Effect size (AUC)

values close to 0 indicate a negative prediction, those close to .50 indicate a chance prediction and those close to 1.0 indicate a positive prediction. Scores that are greater than chance ($p < .05$) are interpreted as indicating a greater likelihood that a violent individual will score higher on the predictive measures than a non-violent individual (Rice & Harris, 1995). Each of the IVs that were significantly associated with violence over time in the correlation analyses for both contextual and individual variables in hypothesis 2a were added to the ROC analysis. AUC's were examined to determine the predictive power of each IV.

To examine hypotheses 3a, logistic regression analyses were conducted to examine whether frequency and/or methods of NSSI significantly predicted group membership (i.e., physically violent vs. not physically violent toward others). Specifically, logistic regression analyses were conducted to examine whether frequency of NSSI significantly predicted a history of physical violence or physical violence perpetration within a one-year period following the baseline assessment. Again, adjusted OR's were examined to assess the predictive power of each IV. These logistic regression analyses were repeated substituting number of methods of NSSI for frequency of NSSI.

Hierarchical logistic regression analyses rather than ordinal HLM procedures were chosen for this particular project, specifically with regard to the individual variables, due to the lack of variability in outcome at specific time points, and because there was no reason to assume in that there would be an effect of time generally. It was, however, possible that the contextual variables themselves would vary over time and may be associated with violence at some timepoints (e.g., for a timepoint in which someone experienced major life stressors) but not others. The only contextual variables in the current study that were examined over time were the life experience (relationship and employment) variables. There was a small number of participants who had valid mean scores on the employment (n = 1 to 9 across T2 to T5) and relationship (n = 2 to 7 across T2 to T5) variables at each time point over the one-year period. As such, the contextual variables were examined at the baseline assessment and, if any of the variables were significantly associated with violence perpetration over time, they were examined prospectively by using baseline data in regression, survival, or ROC analyses to predict violence perpetration over the one-year follow-up period.

Power Analysis

As there is no agreed upon method of conducting an a priori power analysis to determine required sample size with logistic regression analyses (Demidenko, 2006), to

estimate the sample size required for the current study to detect medium or moderate effects of interest (defined as ORs ≥ 2.5 as suggested by Rosenthal, 1996), an examination of published studies investigating a similar number of predictors was conducted. In a study predicting violence as a dichotomous outcome variable (yes/no) using logistic regression analyses, Silver, Mulvey, and Monahan, (1999) were able to detect moderate to large effects of interest (e.g., OR = 2.7 to OR = 4.2) with eight predictors in the model and a sample size of 293 participants. Similarly, another study predicting violence as a dichotomous outcome with logistic regression analyses detected moderate to large effects of interest (e.g., OR = 2.36 to OR = 3.24) with eight predictors in the model and 112 participants (Doyle and Dolan; 2006). In a study examining relationship variables (i.e., attachment styles) and their association with violence as a dichotomous outcome in males, logistic regression analyses with 13 predictors in the model revealed small to moderate significant effects of interest (e.g., OR = 1.55 to OR = 1.94) with a sample size of 149 males (Kesner & McKenry, 1998). Finally, in a study looking at predictors of intimate partner violence perpetration using logistic regression (backward stepwise likelihood ratio model) analyses detected moderate to large effects of interest (e.g., ORs = 2.42, 5.04, and a very large OR = 107.85) with an initial model consisting of eight predictors and a sample size of 200 males and females (Luthra & Gidycz, 2006). Therefore, these findings suggested that, for the present study, a minimum of 112 participants was needed to detect moderate effect sizes (i.e., ORs ≥ 2.5; Rosenthal, 1996).

Results

Preliminary data analyses

An examination of the normal q-q plots for the alcohol and drug use variables indicated several marked deviations from the line of best fit and box plots for each of the substance use variables revealed the presence of several outliers. Descriptive statistics for the substance use variables further indicated that the variables were positively skewed (alcohol use = 2.21, drug use = 2.22) and kurtotic (alcohol use = 5.08, drug use = 5.28). Log transformations of each of the non-normally distributed variables appeared to reduce the skew (alcohol = 1.12, drug use = .77) and kurtosis (alcohol = .24, drug use = -.71) to acceptable levels. Due to the difficulty interpreting transformed variables, bivariate correlation analyses were conducted using both the log-transformed variables and non-transformed variables to compare the results, and the results were not

substantially different. As such, the bivariate correlations using the non-transformed variables were reported below.

An examination of box plots for several of the other individual variables (antisocial and borderline personality traits and impulsivity variables) also indicated the presence of outliers. Despite these outliers, an examination of the q-q plots for each of these variables did not indicate any marked deviations from the line of best fit. In addition, most of the individual variables showed acceptable skew (range = -.09 to .62) and kurtosis (range = -1.30 to .23) values. As such, no data transformations were conducted on the remaining individual variables.

In terms of the contextual variables, an examination of the box plots for each variable revealed the presence of several outliers for the economic and education variables. Nevertheless, an examination of the normal q-q plots for each of the contextual variables did not indicate any marked deviations from the line of best fit, and each of the variables demonstrated acceptable skew (range = -.48 to 1.10) and kurtosis (range = -.85 to .19) values. As such, no data transformations were conducted on the contextual variables.

Descriptive Statistics

At baseline, the majority of participants reported that they engaged in NSSI 3-6 times per week (*n* = 32, 24.1%) or 2-3 times per month (*n* = 32, 24.1%) on average over their lifetime (see Table 2). In terms of the methods of NSSI that participants engaged in, most reported cutting (*n* = 125, 94%) scratching (*n* = 80, 60.2%), and hitting themselves (*n* = 78, 58.6%). Most participants reported engaging in more than one method of NSSI (96.1%) and the modal number of methods was 4 (*n* = 20, 15.6%; see Table 3 for a description of the methods of NSSI reported at baseline and each time point).

In terms of violence, 96 people (72.7%) reported engaging in at least one type of physical violence toward others in their lifetime. Out of those who reported engaging in physical violence, most participants reported having engaged in one to three types of violence (*n* = 60, 62.6%), and the majority of participants indicated they had pushed, grabbed, or shoved someone (*n* = 62, 47.7%), slapped someone (*n* = 61, 46.2%), or thrown something at someone (*n* = 55, 42.0%; see Table 4 for a description of the frequency and methods of violence engaged in at each time point).

At baseline, 8 people reported recent marital separation due to conflict (*M* impact rating = -1.13) and 33 reported a recent break up with a boyfriend or girlfriend (*M* impact rating = -1.49). In terms of employment difficulties, 21 people reported recent trouble

with their employer (*M* impact rating = -1.95) and 12 people reported being fired from their job (*M* impact rating = -1.67).

Regarding treatment engagement, 15 (17.6%) reported following 0-20% of treatment recommendations and 18 (21.1%) people reported following 80-100% of treatment recommendations (see Table 5 for more detail regarding the breakdown of the percentage of treatment recommendations followed by participants).

Hypothesis 1a

None of the contextual variables were significantly associated with a history of violence perpetration (*rs* = -.35 to .10, all *ps* > .04). As the contextual variables were not significant at the bivariate level, they were not entered into a logistic regression analysis with history of physical violence (See Table 6).

Hypothesis 1b

Among the individual variables, there was no significant association of history of physical violence with drug use (r = .14, p = .15), alcohol use (r = .17, p = .07)[2], treatment engagement (r = -.08, p = .45), distress tolerance (r = -.07, p = .44), impulsivity (r = .10, p = .27), or trait anger (r = .20, p = .02). There was a significant positive association of history of violence with antisocial (r = .29, p < .006) and borderline (r = .24, p = .006) personality traits (see Table 7).

To test whether antisocial and borderline personality traits were able to significantly predict group membership as violent or non-violent in a retrospective analysis, a simultaneous logistic regression analyses was conducted. Examination of Cook's Distance and *DFBETA* values did not identify the presence of any influential points. Visual inspection of the q-q plots of the standardized residuals indicated that there were no marked deviations from the line of best fit. In addition, the tolerance (.76) and VIF (1.32) values were within acceptable ranges, indicating that multicollinearity was not present among the predictor variables. Neither age (r = -.07, p = .40) nor lifetime frequency of NSSI (r = -.03, p = .79) was significantly associated with a history of physical violence and were not entered as covariates in the first step of a hierarchical logistic regression analysis. The overall simultaneous model was significant (*-2LL* = 140.09, χ^2 [2] = 14.60, p = .001, Nagelkerke R^2 = .15); however, only the antisocial

[2] With the log-transformed substance use variables, alcohol (r = .19, p = .03) and drug use (r = .15, p = .11) were not significantly associated with a history of physical violence, and thus would not have been entered into the logistic regression analyses.

personality features variable was significant in the final model (OR = 1.95, Wald = 6.23, p = .01; see Table 8).

Hypothesis 2a

Looking at the association of the individual predictors over time, none of the individual predictors were significantly associated with violence over time; however, without using a Bonferroni correction and with a less conservative per-test alpha rate of .05, antisocial personality features (r = .25, p = .02) and trait anger (r = .29, p < .01) were significantly associated with physical violence over the one-year follow-up period. The remaining individual variables were not significantly associated with violence over the one-year follow-up period (rs = -.15 to .16, all ps ≥ .15).

Examination of Cook's distance values (maximum value = 1.12, mean value = .07) indicated the presence of potential outliers; however, the *DFBETA* values for each predictor were within acceptable limits (range = .10 to .58), suggesting that the outliers did not substantially influence the prediction of the regression coefficients. Moreover, visual inspection of the q-q plots of the standardized residuals indicated that there were no marked deviations from the line of best fit, and thus, no transformations were made to the data. Tolerance (.84 to .98) and VIF (1.02 to 1.19) values were within acceptable ranges, and did not indicate the presence of multicollinearity among the predictor variables.

Age (r = -.24, p = .03) and history of violence (r = .27, p = .01) were significantly associated with physical violence over the one-year follow-up period; however, lifetime frequency of NSSI was not (r = -.01, p = .95). Thus, age and history of violence were entered as covariates in the first step of the hierarchical logistic regression analysis. Although antisocial personality features and trait anger were not significantly associated with physical violence over the one-year follow-up period at the Bonferroni corrected per-test alpha rate of .006, they were significant at the .05 level, and so were entered into a hierarchical logistic regression analysis to determine if they were able to significantly predict physical violence over the follow-up period. The final model was significant (*-2LL* = 64.28, χ^2 [4] = 25.69, p < .001, Nagelkerke R^2 = .41); however, only trait anger uniquely predicted violence over time (OR = 2.29, Wald = 6.01, p = .01) in the final model controlling for age and history of violence.

None of the contextual variables were significantly associated with violence perpetration over the one-year time period following the baseline assessment (rs = -.28 to .39, all ps > .07). As the contextual variables were not significant at the bivariate level,

they were not entered into a logistic regression analysis predicting violence perpetration over time. Moreover, because the contextual variables did not appear to be significantly associated with a history of physical violence perpetration or violence perpetration over the one-year follow-up period at the bivariate level, they were not included in subsequent analyses.

Hypothesis 2b

An examination of the scatterplot of the influence residuals (*DFBETA*) for the antisocial and trait anger variables with the participant identification number revealed that the residuals were grouped around 0 with no identifiable patterns. Thus it was determined that the proportional hazards assumption was not violated. Both anger (OR = 1.65, Wald = 5.56, p = .02) and antisocial traits (OR = 1.57, Wald = 3.80, p = .05) significantly predicted time to physical violence perpetration when entered into separate Cox regression analyses. When entered into a simultaneous Cox regression analysis, the overall model was significant (*-2LL* = 165.08, χ^2 [2] = 7.66, p = .02); however, neither variable uniquely predicted time to physical violence in the final model (antisocial OR = 1.41, Wald = 1.80, p = .18; trait anger OR = 1.49, Wald = 3.40, p = .07; see Figure 1). The average time to violence was 131.21 days (minimum = 43.50, maximum = 242.00) and the median was 143.50 days.

Hypothesis 2c

For the ROC analysis, both antisocial personality features (AUC = .66, p = .03; 95% CI = .53 to .79) and trait anger (AUC = .67, p = .02; 95% CI = .54 to .81) produced AUC's that were above chance levels, indicating that there is a 66% and 67% chance that an individual who is violent will achieve higher scores on the predictor variables (antisocial personality features and trait anger) than a non-violent person (see Figure 2).

Hypothesis 3a

Frequency of NSSI was not significantly associated with a history of physical violence perpetration (OR = .96, Wald = .08, p = .78), nor did it predict violence over the one-year time period (OR = .99, Wald = .01, p = .94). Similarly, number of methods of NSSI was not significantly associated with a history of physical violence perpetration (OR = 1.12, Wald = 1.77, p = .18), or violence over time (OR = 1.08, Wald = .52, p = .47).

Discussion

The current study focused specifically on a sample of individuals who engage in NSSI with the aim of providing information on what factors may contribute to violent

behaviour toward others for individuals who also engage in self-directed violence. This study also examined which factors may indicate that an individual who engages in NSSI may be at risk for engaging in future violence toward others. Reports on this type of examination are largely absent from the current literature. It appears that, based on the current findings, stable traits are more important in determining risk for violence than environmental or contextual factors such as income, relationship or employment difficulties. Contextual factors were not significantly associated with physical violence perpetration in the current study, even at baseline.

In terms of specific characteristics that were associated with a history of violence, borderline and antisocial personality features were significantly associated with self-reports of past physical violence in this sample, although only antisocial traits appeared to be uniquely associated with a history of violence. Moreover, antisocial personality traits and trait anger, but not borderline personality features, were significantly associated with future physical violence toward others, although only trait anger uniquely predicted future violence perpetration. Results from the current study indicated that violent individuals are more likely to have higher levels of anger and antisocial traits than non-violent individuals. In addition to predicting risk for future physical violence, antisocial personality features and anger were both significantly predictive of time to violence. Thus, individuals with a disposition characterized by high levels of antisocial features or high levels of anger were more likely to perpetrate physical violence toward others sooner than individuals with low levels of either of these characteristics.

These findings are consistent with the violence literature more generally, in that ASPD has been found to be one of the strongest clinical predictors of violent behaviour (Bonta et al., 1998), and anger is often considered to be an important risk factor in predicting future aggression (Novaco, 1994; Cornell et al., 1999). The current findings are also consistent with past research indicating that anger is predictive of future, but not past, violent behaviour (Cornell et al., 1999). These data, in conjunction with previous studies, suggest that trait anger and antisocial personality features are consistent predictors of future violence. Moreover, these findings also suggest that individuals who engage in NSSI appear to be similar to other, non self-injuring samples in terms of risk factors for violence. Indeed, based on the current findings, it does not appear that there are any particularly unique factors that predict future violence among these individuals. Thus, data from the current study suggest that literature on violence risk and violence prediction may generalize to individuals who engage in self-directed violence.

In terms of the potential implications of these findings, the current data suggest the need to assess and target violence among individuals who engage NSSI, which is not common in current clinical practice with these individuals. Indeed, the present study found relatively high rates of violence among individuals who engage in non-suicidal self-injury, a finding that is consistent with previous research looking at self-injurious behaviour more generally regardless of the intent of the behaviour (i.e., whether suicidal or non-suicidal; Hillbrand et al., 1994; Hillbrand et al., 1996). Previous studies examining community samples (*n* = 368) of United States residents have found rates of violence around 3.7% (Swanson, Holzer, Ganju, & Jono, 1990). Other studies of civil psychiatric inpatients (*n* = 193) have found rates of past violent behaviour as high as 62% (Douglas, Ogloff, Nicholls, & Grant, 1999). Thus, the presence of these high rates of past violence even among a non-forensic sample is particularly noteworthy.

It may also be important when treating individuals who engage in both NSSI and violence toward others in the community or in custody settings to first identify these individuals as being different than individuals who engage primarily in NSSI who do not engage in violence. Those who engage in both types of violence may be a unique subgroup of individuals with histories of NSSI, and different types of assessment, treatment and risk management strategies may be needed. Indeed, risk for violence should be assessed on an on-going basis in clinical settings focused on treating individuals who engage in NSSI.

Based on the current findings, it may be more effective to target aspects of personality or temperament that are related to violence rather than current or recent life circumstances with this population. Literature on NSSI supports the conceptualization of NSSI as an emotion regulation strategy (Chapman et al., 2006; Gratz, 2003), and thus, treatments targeting NSSI behaviours tend to focus on emotion regulation more broadly, perhaps because of early work and theory that is more relevant to highly emotional individuals with BPD and BPD traits who may engage in NSSI to reduce unwanted emotional arousal (e.g., Linehan, 1993). In contrast, the subgroup of individuals who engage in both NSSI and violence toward others may require interventions that focus more on antisocial features and anger. Previous research and theory suggesting hyper-emotionality and poor regulation of intense emotions may not accurately generalize to this group. Future research could examine whether treatment programs focused on addressing antisocial personality traits and trait anger result in a decrease in the frequency of both NSSI and violence toward others.

Several study limitations warrant comment. For example, relatively few people engaged in violence over the one-year period, and perhaps due in part to the exclusively online and international nature of the study, there was a relatively high rate of participant attrition. This may have affected my ability to make meaningful group distinctions and predict violence over time. The data used for this study came from a larger project on NSSI, and the aim of the larger project was not specifically to examine violence toward others, nor was it to recruit people specifically who engage in such violence. Future research, therefore, might target recruitment to include people who engage in NSSI alone, NSSI and violence toward others, and possibly varying levels of violence (to capture the higher end of severity of violence toward others that was likely underrepresented in this sample). In addition, the small number of participants who reported experiencing some of the contextual variables both in the past year and prospectively (e.g., divorce, trouble with employer, etc.) may have limited my ability to detect significant associations of these variables with violent behaviour, although the non-significant associations of life events with violence found in the current study are consistent with some past research using the LES (Klassen & O'Connor, 1988). Nevertheless, it is possible that with a larger sample of individuals who have experienced these events the associations with violence may be significant.

It is also possible that the validity or reliability of the questionnaires may be called into question given that these measures have not been validated for use with on-line data collection methods. Moreover, only a subset of the many possible IVs that are related to violence were explored. As such, other variables may play an important role in determining whether an individual who engages in NSSI will also engage in violence toward others.

Ideally, to better understand the relationship between non-suicidal self-injury and violence toward others, future research should examine a larger subset of individuals who engage primarily in violence or NSSI, violence and NSSI, and individuals who do not engage in either behaviour. Given the low base-rates of violence and NSSI in the community, it is important that future studies examining this relationship specifically recruit individuals who have engaged in violence and NSSI in order to achieve high enough power to detect significant effects of interest. This way, research may be able to accurately determine what factors distinguish individuals who engage in both behaviours from those who engage only in one or neither of the behaviours. Moreover, future research should also examine other potential predictors of violence and NSSI, such as

self-directed and other-directed anger, to further understand the specific factors that distinguish and predict each of these behaviours. It may also be important to assess violence and NSSI over a longer period of time and, if possible, use different data analytic methods such as ordinal hierarchical linear modelling in order to examine potential mediators or moderators of these behaviours over time.

These findings may also have implications for future research conducted on the phenomenon of NSSI. Currently, it is not common practice in the field of research on NSSI to assess whether individuals also engage in violent behaviour toward others. Future research in the area should address this unique composition and perhaps assess these groups differently when examining associations between NSSI behaviours and other variables. For example, the functions of NSSI may be different in a group of individuals that also engage in violence toward others, rather than primarily NSSI behaviours.

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Appendices

Appendix A

Table 1
Demographic Characteristics of the Sample

Characteristic	*n*	%
Ethnicity		
Asian (Chinese, Japanese, etc.)	4	3.0
Black (African, Caribbean, etc.)	2	1.5
Aboriginal/First Nations (Inuit, Metis, etc.)	1	0.8
South Asian (East Indian, Pakistani, etc.)	1	0.8
White (Eastern European, etc.)	125	94.0
Country of Residence		
United States	64	48.3
United Kingdom	19	14.6
Canada	23	17.3
Australia	10	7.6
Germany	3	2.3
New Zealand	4	3.0
Other (Denmark, Finland, Greece, Israel, Italy, Mexico, Netherlands, Russia, South Africa, and Thailand, *n*=1)	10	8.0
Education		
Attended High School	21	15.8
Completed High School	20	15.0
Attended College/University	63	47.4
Completed University Degree	23	17.3
Completed Graduate Degree	6	4.5
Income		
> $100,000	13	9.8
$50,000 to $99,999	20	15.0
$35,000 to $49,999	28	21.1
< $34,999	48	36.1
Preferred not to respond	24	18.0

Appendix B

Table 2
Frequencies of Self-Injury at Each Time Point

	Baseline	T2	T3	T4	T5
	n=133 (%)	*n*=75 (%)	*n*=59 (%)	*n*=48 (%)	*n*=36 (%)
Frequency of NSSI					
Daily or more than once a day	16 (12.0)	3 (4.0)	1 (0.8)	2 (4.2)	2 (5.6)
3-6 times a week	32 (24.1)	3 (4.0)	4 (3.0)	3 (6.3)	3 (8.3)
1-2 times a week	23 (17.3)	10 (13.3)	6 (4.5)	7 (5.3)	3 (8.3)
2-3 times a month	32 (24.1)	25 (33.3)	13 (9.8)	8 (6.0)	6 (16.7)
Once a month or less often	24 (18.0)	18 (24.0)	23 (17.3)	21 (15.8)	11 (30.6)
I haven't hurt myself in the last 3 months *(T2-T5)*		16 (21.3)	12 (9.0)	7 (5.3)	11 (30.6)

Appendix C

Table 3
Methods of Self-Injury at Each Time Point

	Baseline	T2	T3	T4	T5
	n=133 (%)	*n*=75 (%)	*n*=59 (%)	*n*=48 (%)	*n*=36 (%)
Method of NSSI					
Cutting (e.g., with razor blades or other sharp objects)	125 (94.0)	72	53	44	32
Burning (e.g., with cigarettes or other hot objects)	64 (48.1)	32	24	14	12
Scalding (e.g., with boiling water or other hot substances)	31 (23.3)	19	14	6	2
Banging head against a wall	52 (39.1)	19	17	11	9
Bloodletting	30 (22.6)	17	14	12	10
Piercing (e.g., with needles or other sharp objects)	61 (45.9)	24	21	10	11
Hitting oneself	78 (58.6)	37	30	21	15
Self-strangulation	28 (21.1)	17	12	8	5
Scratching until bleeding	80 (60.2)	37	23	16	13
Removing skin	36 (27.1)	18	12	10	8
Pulling out hair	35 (26.3)	16	9	7	6
Prescription and illicit drugs	64 (48.1)	30	24	17	10
Number of Methods of NSSI					
1-3	33 (24.8)	33 (44.6)	33 (24.8)	26 (55.3)	16 (48.5)
4-6	56 (42.1)	26 (35.2)	13 (9.9)	15 (31.9)	13 (39.4)
7-9	31 (23.3)	9 (12.3)	5 (3.8)	2 (4.2)	0 (0.0)
10-12	8 (6.1)	6 (8.1)	7 (5.3)	4 (8.5)	4 (12.2)

Note. Methods of NSSI for time points 2 through 5 were calculated by recoding time from reported urge to engage in NSSI to NSSI act scores 1 through 4 (i.e., 1= “less than 1 minute”, 2 = “1 minute to 1 hour”, 3 = “1 hour to 1 day”, 4 = “more than 1 day”) to “1” for those who reported engaging in a particular method at that time point, and then summing the number of methods reported.

Appendix D

Table 4
Frequencies and Methods of Violence at Each Time Point

	Baseline	T2	T3	T4	T5
	n=133 (%)	*n*=75 (%)	*n*=59 (%)	*n*=48 (%)	*n*=36 (%)
Physical violence					
Yes	96 (72.7)	16 (22.9)	8 (14.8)	3 (6.7)	1 (2.9)
No	36 (27.3)	54 (77.1)	46 (85.2)	42 (93.3)	34 (97.1)
Method of violence					
Thrown something at someone	55 (42.0)	5 (6.8)	3 (5.3)	1 (2.2)	0 (0.0)
Pushed, grabbed, shoved, anyone	62 (47.7)	11 (14.9)	3 (5.3)	1 (2.2)	0 (0.0)
Slapped anyone	61 (46.2)	6 (8.1)	1 (1.7)	2 (4.2)	1 (2.8)
Kicked, bitten or choked anyone	39 (29.5)	4 (5.4)	1 (1.7)	0 (0.0)	1 (2.8)
Hit anyone with fist or object, or beaten up anyone	25 (19.4)	3 (4.1)	2 (3.3)	0 (0.0)	0 (0.0)
Tried to physical force anyone to have sex against their will	2 (1.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Threatened anyone with a knife or gun or other lethal weapon	11 (8.4)	0 (0.0)	1 (1.7)	1 (2.2)	0 (0.0)
Used a knife or fired gun at anyone	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Done anything else which might be considered violent	28 (21.2)	4 (5.5)	0 (0.0)	0 (0.0)	0 (0.0)
Number of Methods of Violence					
1-3	60 (62.6)	14 (10.6)	8 (6.1)	3 (2.3)	1 (0.8)
4-6	35 (36.5)	2 (1.5)	0 (0.0)	0 (0.0)	0 (0.0)
7-9	1 (1.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)

Appendix E

Table 5
Treatment Compliance

Percentage of recommendations followed	*n*	%
0-20%	15	17.6
20-40%	14	16.5
40-60%	12	14.1
60-70%	11	12.9
70-80%	15	17.6
80-90%	15	17.6
90-100%	3	3.5

Appendix F

Table 6
Contextual Variable Zero-Order Correlations at Baseline

	History of Violence	Employment problems	Relationship problems	Education level
	r	*r*	*r*	*r*
Employment problems	.10			
Relationship problems	-.35*	-.02		
Education level	.02	-.45*	.15	
Income level	.00	.23	.19	-.01

** Significant at the $p < .01$ level
* Significant at the $p < .05$ level

Appendix G

Table 7
Individual Variable Zero-Order Correlations at Baseline

	History of Violence	Antisocial traits	Borderline traits	Trait anger	Alcohol use	Drug use	Treatment engagement	Distress tolerance
	r	*r*	*r*	*r*	*r*	*r*	*r*	*r*
Antisocial traits	**.29****							
Borderline traits	**.24****	.49**						
Trait anger	.20*	.33**	.28**					
Alcohol use	.17	.43**	.11	.23*				
Drug use	.14	.43**	.25*	.12	.50**			
Treatment engagement	-.08	-.15	-.13	-.12	-.28*	-.14		
Distress tolerance	-.07	-.11	-.42**	-.15	-.08	-.06	.03	
Impulsivity	.10	.41**	.54**	.16	.09	.24*	-.06	-.29**

** Significant at the $p < .006$ level
* Significant at the $p < .05$ level

Appendix H

Table 8
Logistic Regression Analysis with History of Violence

Predictor	*B*	SE (*B*)	Wald	e^B (95% CI)	Sig.	Model χ^2
Antisocial traits	.67	.27	6.23	1.95 (1.15-3.30)	.013	14.60 (*p*=.001)
Borderline traits	.34	.24	2.01	1.40 (0.88-2.22)	.157	

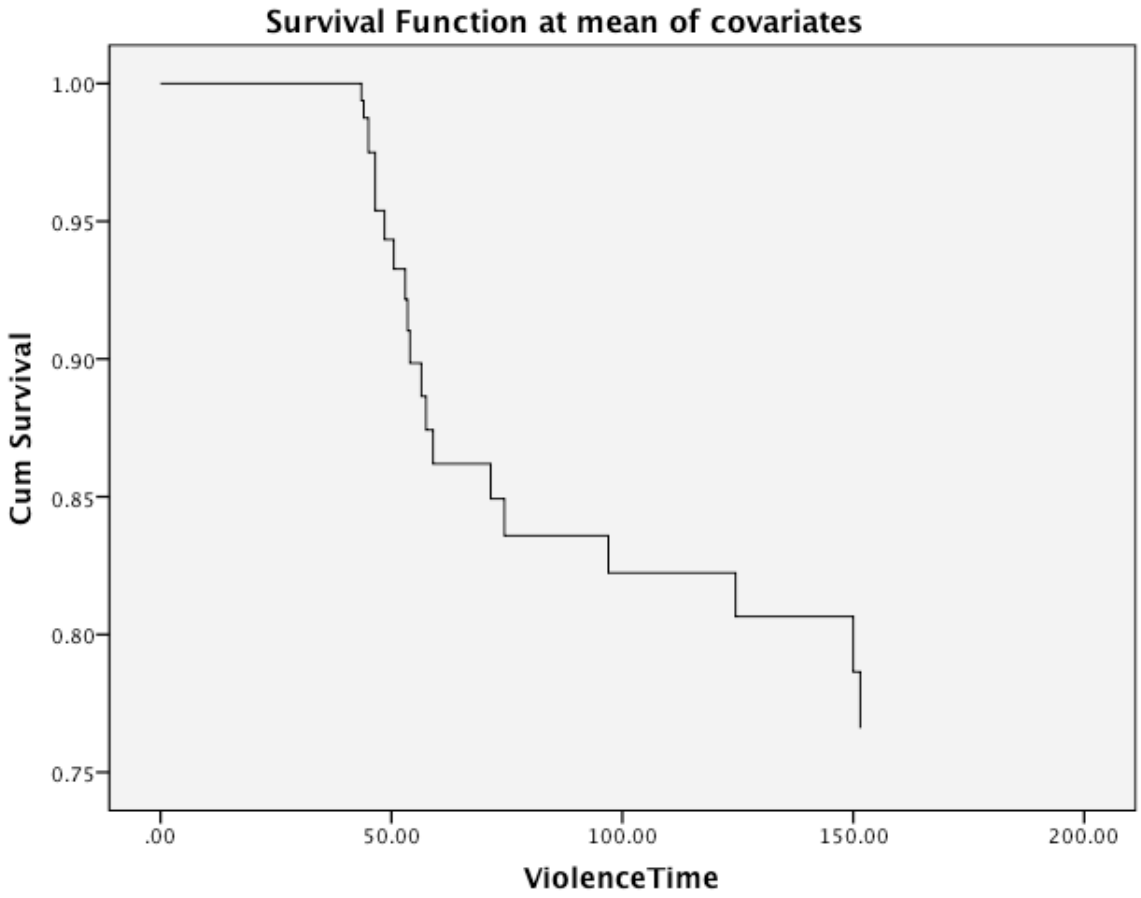
Appendix I

Table 9
Final Logistic Regression Model Predicting Violence Over Time

Predictor	*B*	SE (*B*)	Wald	e^B (95% CI)	Sig.	Model χ^2
History of violence	-1.95	.90	4.68	.14 (0.02-0.83)	.031	25.69 (*p*<.001)
Age	-.31	.11	8.12	.74 (0.60-0.91)	.004	
Antisocial traits	.42	.38	1.21	1.52 (0.72-3.21)	.270	
Trait anger	.83	.34	6.01	2.29 (1.18-4.42)	.014	

Appendix J

Figure 1. Survival function at mean of trait anger and antisocial personality features covariates



Appendix K

Figure 2. ROC curve