

Learning from Experience: A Longitudinal Investigation of the
Consequences, Frequency, and Versatility of Nonsuicidal Self-Injury

by

Christina Lauren Robillard
Bachelor of Science (Honours), McGill University, 2018

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Abstract

Nonsuicidal self-injury (NSSI) refers to direct and deliberate damage of one's bodily tissue without the intent to die. Although NSSI abates over time for most young people, 8-32% of those with a history of NSSI exhibit a severe pattern of engagement characterized by high or increasing NSSI frequency (i.e., number of episodes) and versatility (i.e., number of methods). Unfortunately, despite these markers of NSSI severity conferring risk for psychosocial dysfunction and suicidal behaviour, the mechanisms that explain why NSSI increases in frequency or versatility are poorly understood. Behavioural models of NSSI propose that experiencing desirable emotional and social consequences following NSSI is a key mechanism that increases the intensity/strength of the behaviour. Yet, behavioural models of NSSI do not specify whether experiencing more desirable consequences *relative to other people* (i.e., between-person) or experiencing more desirable consequences *relative to one's own average* (i.e., within-person) more strongly predicts future NSSI severity. To address this gap in theory, the present study investigated the influence of between- and within-person desirable NSSI consequences on the frequency and versatility of NSSI over four lags spaced three months apart. 210 adolescents and adults (93.81% female, $M_{\text{age}} = 22.95$ [$SD = 7.17$]) with a history of NSSI were recruited from NSSI communities on social networking websites and completed self-report surveys assessing the desirable consequences, frequency, and versatility of NSSI every three months for one year. At the within-person level, time-lagged hierarchical linear models revealed that experiencing more desirable emotional consequences following NSSI at Time_T , relative to one's own average, was unrelated to NSSI frequency at Time_{T+1} , but predicted a rise in NSSI versatility at Time_{T+1} . Conversely, experiencing more desirable social consequences following NSSI at Time_T , relative to one's own average, predicted a decrease in NSSI frequency at Time_{T+1} , but was unrelated to NSSI versatility at Time_{T+1} . At the between-person level, neither desirable emotional consequences nor desirable social consequences of NSSI predicted NSSI frequency or versatility during the study. While only partially consistent with behavioural models of NSSI, these results suggest that: (1) desirable emotional and social consequences of NSSI exert opposing influences on NSSI severity, (2) within-person increases in desirable emotional consequences of NSSI portend periods of elevated NSSI risk, and (3) empirical tests of behavioural models of NSSI should consider not only how many times but how many ways a person self-injures. By enhancing our understanding of why some individuals persistently self-injure, this study provides a springboard for refining behavioural models of NSSI, advancing longitudinal research on the contingencies that maintain self-injury, and ameliorating intervention efforts that draw on the principle of operant conditioning to reduce NSSI.

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Learning from Experience: A Longitudinal Investigation of the Consequences, Frequency, and Versatility of Nonsuicidal Self-Injury

Nonsuicidal self-injury (NSSI) is defined in the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5) as direct and deliberate damage of one's bodily tissue without the intent to die, and includes behaviours such as cutting, burning, and hitting oneself (American Psychiatric Association [APA], 2013). The pooled lifetime prevalence of NSSI in nonclinical, international samples is 17% among adolescents, 13% among young adults, and 6% among adults over 25 years old (Swannell et al., 2014). NSSI is even more common in clinical samples, with 40-80% of adolescents (Darche, 1990; DiClemente et al., 1991; Nock & Prinstein, 2004) and 20% of adults (Briere & Gil, 1998) reporting at least one episode of NSSI in their lifetime. NSSI typically has its onset in early adolescence, peaks around 15-16 years old, and declines in young to middle adulthood (Plener et al., 2015); yet, 30-40% of young adults with a history of NSSI report past-year engagement in the behaviour (Hamza & Willoughby, 2014; Heath et al., 2009; Whitlock et al., 2015; Wilcox et al., 2012), indicating that a substantial number of individuals self-injure past adolescence. Evidently, NSSI is a pervasive problem in young people.

By virtue of engaging in NSSI, individuals are at elevated risk for unintentionally severe wounds, infection, and scarring (Lewis & Mehrabkhani, 2016; Whitlock et al., 2006). NSSI is also associated with a host of mental health difficulties (e.g., anxiety, depression, borderline personality disorder, eating disorders, substance use disorders; Klonsky et al., 2003; Nock et al., 2006), interpersonal problems (e.g., poor quality relationships, deficits in social problem-solving; Hilt et al., 2008; Nock & Mendes, 2008), and significant functional impairment (e.g., unemployment, financial hardship; Borschmann et al., 2017). Arguably the most troubling finding, however, is the robust association between NSSI and suicidal thoughts and behaviours (see Grandclerc et al., 2016,

for a review). Whereas NSSI is distinct from suicidal behaviour in that it occurs without the intent to die, people who engage in NSSI are at increased risk for future suicidal ideation and attempts, over and above established risk factors such as depression, hopelessness, and features of borderline personality disorder (Asarnow et al., 2011; Guan et al., 2012; Hamza & Willoughby, 2016; Whitlock et al., 2013). Moreover, individuals who are hospitalized for an NSSI episode have a 30-fold higher risk of dying by suicide relative to the general population (Cooper et al., 2005). Collectively, these findings substantiate NSSI as a major public health issue and underscore the need for increased research to better understand, reduce, and prevent this risky behaviour.

The high prevalence and alarming correlates of NSSI have sparked efforts to identify indicators of NSSI severity that demarcate individuals most in need of support. To date, NSSI severity has largely been conceptualized in terms of its *frequency* (i.e., number of episodes). Indeed, NSSI frequency plays a key role in the diagnostic criteria of NSSI disorder in the DSM-5, with individuals requiring at least five episodes of NSSI in the past year to receive a diagnosis (APA, 2013). This is not surprising given the extensive body of literature linking NSSI frequency to emotion dysregulation (Zielinski et al., 2018), psychiatric symptoms (e.g., anxiety, depression, disordered eating, substance misuse; Brausch & Boone, 2015; Di Pierro et al., 2012; Glenn & Klonsky, 2011), and suicide attempts (see Victor & Klonsky, 2014, for a meta-analytic review). Although less widely researched, emerging evidence suggests that the *versatility* (i.e., number of methods) of NSSI is another salient marker of severity (Saraff & Pepper, 2014). Similar to NSSI frequency, using a greater number of NSSI methods is related to psychopathology (e.g., depression, anxiety; Klonsky & Olino, 2008), maladaptive personality traits (Robertson et al., 2013), and suicide attempts (Victor & Klonsky, 2014). NSSI frequency and versatility may also work in tandem to influence suicidality, as the magnitude of the relation between NSSI frequency

and suicidal behaviour has been shown to increase as people engage in a wider variety of NSSI methods (Anestis et al., 2015). It is believed that frequent engagement in multiple NSSI methods can lead individuals to select increasingly lethal forms of self-injury as they gain comfort with inflicting harm on their bodies (Anestis et al., 2015), highlighting the need to consider both how many times and how many ways a person self-injures in our conceptualization of NSSI severity.

There is substantial heterogeneity in the frequency and versatility with which individuals engage in NSSI, suggesting that NSSI severity lies on a continuum (see Jacobson & Gould, 2007, for a review). Distinct subgroups of adolescents and young adults with a history of NSSI can be empirically identified based on how many times and how many ways they self-injure, such that 57-80% fall into a “low severity” group characterized by low NSSI frequency and versatility while 8-32% fall into a “high severity” group characterized by high NSSI frequency and versatility (Bracken-Minor et al., 2012; Hamza & Willoughby, 2013; Klonsky & Olino, 2008). Moreover, whereas NSSI abates over the span of one year for most adolescents, roughly 14% of those with a history of NSSI experience a rise in NSSI frequency and versatility (Andrews et al., 2013). Altogether, these findings suggest that 8-32% of young people with a history of NSSI develop a chronic pattern of engagement characterized by high or increasing NSSI severity. Given that these individuals are at a particularly high risk for psychosocial dysfunction and suicidal behaviour (Andrews et al., 2013; Bracken-Minor et al., 2012; Hamza & Willoughby, 2013; Klonsky & Olino, 2008), identifying predictors of increasing NSSI severity is an imperative endeavour that can help direct intervention resources to those most in need and illuminate treatment targets to reduce NSSI.

Behavioural Models of NSSI

Operant conditioning is a fundamental learning process in humans and other animals (Skinner, 1938, 1953). According to this principle of behavioural psychology, the consequences

of a behaviour strongly influence the intensity/strength with which it is repeated. Specifically, behaviours that are followed by desirable consequences are strengthened through negative reinforcement (i.e., the removal of an unfavourable stimulus) or positive reinforcement (i.e., the presentation of a favourable stimulus), resulting in greater repetition or generalization of the behaviour (Skinner, 1938). Conversely, behaviours that are followed by undesirable consequences are deterred through punishment, such that they are unlikely to be repeated or generalized (Skinner, 1938). One key tenet of operant conditioning is that the timing of consequences impacts the degree to which the target behaviour is reinforced or punished, such that immediate consequences exert a stronger influence on the target behaviour than distal consequences (Ferster & Skinner, 1957; Skinner, 1938). A second tenet of operant conditioning is that the consequences that follow a target behaviour can influence engagement in behaviours that are functionally similar to the target behaviour through the process of *response generalization* (Skinner, 1953). With respect to NSSI, therefore, people who experience more desirable consequences following the behaviour should be particularly vulnerable to exhibiting an increase in NSSI severity, which could manifest as a rise in frequency and/or versatility, whereas those who experience few desirable consequences following NSSI should desist from NSSI as the strength of the behavioural response fades.

Indeed, several behavioural models of NSSI adopt the robust, well-validated principle of operant conditioning to account for the severity of NSSI (Chapman et al., 2006; Hooley & Franklin, 2018; Nock, 2008; Nock & Prinstein, 2004). A common proposition across these models is that NSSI is reinforced by the antecedents and consequences that immediately follow the behaviour, hereafter termed the *functions* of NSSI. According to the *experiential avoidance model* (EAM), for instance, the primary function of NSSI is to avoid or escape unwanted internal experiences, such as distressing thoughts, feelings, and somatic sensations (Chapman et al., 2006).

Whereas undesirable consequences of NSSI (e.g., experiencing shame, scarring, or negative reactions from others) are thought to occur in the days, weeks, or months following the behaviour, NSSI is believed to immediately reduce unwanted internal experiences by allowing the person to focus their attention on salient aspects of NSSI, such as physical pain or seeing blood, rather than their distress (Chapman et al., 2006). The consequent reduction in aversive internal experiences negatively reinforces NSSI, increasing the likelihood that the person will repeat NSSI when they feel distressed (Chapman et al., 2006). Over time, the repeated negative reinforcement of NSSI creates a vicious cycle whereby the association between aversive internal experiences and NSSI is strengthened, such that NSSI becomes a conditioned escape response (Chapman et al., 2006).

The *four function model* (FFM) similarly proposes that NSSI is maintained by desirable consequences; however, while the EAM proposes that NSSI is repeated primarily because it leads to desirable internal consequences that are negatively reinforcing, the FFM posits that both negative and positive feedback loops, as well as desirable social consequences, perpetuate engagement in NSSI (Nock & Prinstein, 2004). Specifically, the FFM asserts that NSSI can serve four functions that are organized along two orthogonal dimensions (Nock & Prinstein, 2004). The first dimension refers to whether NSSI leads to desirable changes within the individual (i.e., automatic functions) or in the interpersonal environment (i.e., social functions; Nock & Prinstein, 2004). The second dimension refers to whether NSSI is negatively reinforced or positively reinforced (Nock & Prinstein, 2004). Together, these dimensions create four distinct reinforcement processes that maintain NSSI: automatic negative reinforcement (i.e., reduction of undesirable internal states), automatic positive reinforcement (i.e., generation of desirable internal states), social negative reinforcement (i.e., reduction of undesirable social states), and social positive reinforcement (i.e., generation of desirable social states; Nock & Prinstein, 2004).

To expand on the social dimension of the FFM, Nock (2008) proposed a social functions model that integrates perspectives from psychology, evolutionary biology, and cultural anthropology to explain the social reinforcement of NSSI. This elaborated model posits that humans, like other animals, rely on behaviours that signal their distress or strength to members of their species to meet their reproductive and survival needs; specifically, behaviours that convey distress function to elicit caregiving from others and behaviours that convey strength serve to ward off potential aggressors (Nock, 2008). According to Nock (2008), NSSI can fulfill either of these social functions. Although physically and psychologically costly, NSSI can represent a high-intensity distress signal that mobilizes support and caregiving when other forms of communication (e.g., crying, yelling) fail to meet interpersonal needs (Nock, 2008). Conversely, NSSI can represent a signal of strength that conveys one's resilience and ability to withstand injury, which in turn reduces unwanted social demands or attention (Nock, 2008). Consistent with the EAM and FFM, this model posits that NSSI is likely to become chronic when it proves to be an effective means of engendering these desirable social consequences (Nock, 2008).

The models of NSSI described thus far explain how the desirable consequences of NSSI increase the intensity/strength of the behaviour; yet, these models do not shed light on the marked variability in NSSI severity that has been observed in previous studies (Andrews et al., 2013; Bracken-Minor et al., 2012; Hamza & Willoughby, 2013; Klonsky & Olino, 2008). To my knowledge, the *benefits and barriers model* (BBM) is the only model of NSSI that attempts to explain why some people develop a pattern of severe NSSI whereas others do not (Hooley & Franklin, 2018). According to the BBM, whether a person engages in NSSI depends on the balance between the benefits of NSSI (e.g., improved affect, increased group affiliation) and the barriers to NSSI (e.g., fear of pain, prohibitive social norms); the benefits must outweigh the barriers for

an episode of NSSI to occur, which can be achieved through heightened awareness of the emotion-modulating effects of NSSI, erosion of barriers over time, or individual differences that produce chronically low barriers in some people (Hooley & Franklin, 2018). Consistent with the principle of operant conditioning, the BBM further proposes that individuals who experience strong benefits of NSSI and/or low barriers to NSSI are likely to follow a severe NSSI trajectory (Hooley & Franklin, 2018). In contrast, people who experience few benefits of NSSI (e.g., the improvement in affect after NSSI is brief or subtle) or quick re-instatement of barriers to NSSI (e.g., experiencing negative reactions after NSSI) are expected to exhibit a reduction in the intensity/strength of NSSI and eventually adopt other emotion regulation strategies instead (Hooley & Franklin, 2018).

Motives for NSSI

To date, delineation of the contingencies that reinforce NSSI have largely been examined by asking people why they engage in NSSI (i.e., examining the self-reported motives for NSSI), with data-driven models suggesting that NSSI motives can be classified into two broad categories: emotion regulation motives and social motives (Klonsky & Glenn, 2009; Klonsky et al., 2015). With respect to the emotion regulation motives for NSSI, a recent meta-analytic review found that 62-78% of people with a history of NSSI report engaging in NSSI to escape aversive internal states, such as “*to stop bad feelings*” and “*to experience relief from a terrible state of mind*” (Taylor et al., 2018). Roughly 42-57% of individuals who self-injure also report engaging in NSSI to generate positive emotional states, such as relaxation, pleasure, and exhilaration (Taylor et al., 2018). Social motives for NSSI, such as “*to fit in with my peer-group*” or “*to let others know how desperate I am*”, are less frequently endorsed (33-56%; Taylor et al., 2018) and are typically rated as secondary to emotion regulation motives (Klonsky, 2009); for example, in a sample of community adults with a history of NSSI, only 5% endorsed using NSSI “*to let others know what*

I'm going through” as their primary motive, whereas 28% rated this item as their secondary motive (Klonsky, 2009). That said, it is possible that self-report studies underestimate the true prevalence of social motives for NSSI, as endorsing these motives may carry a particularly high risk of experiencing stigma or eliciting negative reactions from others (Nock, 2008). Supporting the possibility of a reporting bias, young adults tend to endorse social motives as the main reason for other people’s NSSI, but not for their own (Heath et al., 2009).

Although asking people why they engage in NSSI can elucidate the motivation(s) of the act, a major drawback of this approach is that it does not tell us whether NSSI results in the intended consequence(s). For example, an individual who reports engaging in NSSI “*to stop bad feelings*” may or may not perceive a reduction in negative emotions following the behaviour. Indeed, some people report feeling worse, or at least unchanged, following NSSI (Kakhnovets et al., 2010; Kleindienst et al., 2008; Power et al., 2015), suggesting that NSSI only results in the intended consequence(s) for some episodes of the behaviour, or for certain individuals. This is a critical distinction for research because a central tenet of behavioural models of NSSI is that the consequences that follow NSSI, rather than the motives that are attributed to the behaviour, influence the intensity/strength with which it is repeated (Chapman et al., 2006; Hooley & Franklin, 2018; Nock, 2008; Nock & Prinstein, 2004). Thus, research that investigates the emotional and social consequences of NSSI is critical to testing behavioural models and advancing our understanding of the contingencies that lead to increases in NSSI severity.

Emotional Consequences of NSSI

Various methodologies have been used to investigate the emotional consequences of NSSI, including retrospective self-report measures, *ecological momentary assessment* (EMA), and laboratory-based paradigms. Retrospective self-report measures are the most widely used given

their cost-effectiveness and ease of administration. Unfortunately, this approach is limited by well-established recall bias (Nisbett & Wilson, 1977; Schacter, 1999), as participants' recollections of their emotional states before and after potentially distant episodes of NSSI may be inaccurate or difficult to describe (Klonsky, 2007). Notwithstanding this limitation, retrospective self-report studies are unanimous in finding that NSSI is followed by decreases in negative emotions. Among a sample of community adolescents, for instance, negative emotions such as anger, depression, and loneliness were perceived to diminish following NSSI (Laye-Gindhu & Schonert-Reichl, 2005). Likewise, among a sample of adult inpatients, a substantial proportion reported decreases in tension (95%), anxiety (52%), sadness (44%), and guilt (39%) after NSSI (Kleindienst et al., 2008). Just as NSSI is reported to reduce negative emotions, NSSI is often described by people who self-injure as leading to increases in positive emotions, such as relief, happiness, and euphoria (Jenkins & Schmitz, 2012; Kleindienst et al., 2008; Klonsky, 2009; Muehlenkamp et al., 2009). That said, while NSSI may produce short-term improvements in affect, negative emotions often return with greater frequency or intensity in the months and years that follow (Buelens et al., 2019; Burke et al., 2015; You et al., 2012), ostensibly because individuals who engage in NSSI do not develop distress tolerance or the ability to manage negative emotions adaptively (Nock & Mendes, 2008). In other words, the desirable emotional consequences of NSSI appear to be short-lived.

To circumvent some of recall bias inherent to retrospective self-report measures, EMA has become an increasingly popular research method for investigating the emotional consequences of NSSI. EMA studies repeatedly assess the same individual as they go about their daily lives, which permits examination of the emotional and social processes that occur before, during, and after a behaviour (Shiffman et al., 2008). Overall, EMA studies have yielded similar results to retrospective self-report studies in terms of the valence and quality of emotional NSSI

consequences (see Rodríguez-Blanco et al., 2018, for a review). For example, one EMA study of community adults found that those who engaged in NSSI during the study period experienced increases in negative affect prior to NSSI that peaked during the episode and gradually faded in the hours afterward (Armey et al., 2011). Similarly, a more recent EMA study of community youth and young adults found that decreases in negative emotions and increases in positive emotions were evident two to four hours following episodes of NSSI (Kranzler et al., 2018). While EMA techniques alleviate some of the limitations associated with retrospective recall bias, this method has some noteworthy drawbacks. EMA studies tend to have small sample sizes (e.g., 30-40 participants) and short assessment periods (e.g., two weeks) that restrict the generalizability of findings (Rodríguez-Blanco et al., 2018). Furthermore, EMA is still limited in that people may not have insight into their mental processes and thus have difficulty reporting on their emotions (Nisbett & Wilson, 1977), even though reports occur much closer in time to the target behaviour.

Laboratory-based research offers an alternative to self-report designs and has provided more objective evidence for the desirable emotional consequences of NSSI. These studies examine the emotion regulatory function of NSSI by measuring self-reported and/or psychophysiological indices of affect before and after administration of an NSSI-proxy (i.e., experimental stimulus that approximates some aspects of NSSI). Collectively, this body of research demonstrates that negative emotions decrease following NSSI by showing reductions in negative affect when people with a history of NSSI imagine engaging in the behaviour (Haines et al., 1995), place their arm in a painful ice water bath (Russ et al., 1992), or receive an incision to the forearm that mimics NSSI (Reitz et al., 2015). Experimental research also corroborates the idea that positive emotions increase after NSSI; for instance, Franklin et al. (2013) administered painful electric shocks to university students and found that the removal of pain was related to concurrent decreases in startle

eyeblick reactivity, a defensive reflex potentiated by unpleasant stimuli (Lang et al., 1990), and increases in startle postauricular reactivity, a response potentiated by positive emotions (Benning et al., 2004; Johnson et al., 2012). Together, these findings support the paradoxical nature of NSSI in that physical harm to one's body can decrease negative emotions and increase positive emotions.

Social Consequences of NSSI

The social consequences of NSSI have not been as extensively studied as the emotional consequences of NSSI. Although NSSI was often discussed in the 1980s and 1990s as a form of manipulation, attention-seeking, or a cry for help in the absence of genuine distress (e.g., Favazza & Rosenthal, 1993; Rosen & Walsh, 1989; Rosen et al., 1990), this view is recognized as highly pejorative today. Thus, one reason for the paucity of research on the social consequences of NSSI may be that researchers do not want to inadvertently reintroduce or perpetuate this stigmatizing view of NSSI. Another possibility is that researchers have simply followed what participants have told them. When asked to report on why they self-injure, people with a history of NSSI overwhelming respond that it helps them feel better by reducing distress (Taylor et al., 2018). Consequently, the field of NSSI may have invested its resources into understanding the frequently endorsed emotional consequences of NSSI, even if this represents just one piece of the puzzle.

Nevertheless, emerging evidence suggests that NSSI is sometimes followed by desirable changes in the social environment. Following NSSI, many young adults report that family members (44%) and close friends (51%) became concerned for them, fights with family or friends were avoided (39%), they felt closer to others (21%), and they were taken more seriously (13%; Klonsky, 2009). Longitudinal studies corroborate this notion as well; Hilt et al. (2008) found that adolescent girls who engaged in NSSI reported improved relationship quality with their fathers over one year, whereas girls who engaged in other risky behaviours (i.e., cigarette, alcohol, or drug

use) did not. Finally, one EMA study that examined 20-hour windows surrounding acts of NSSI in a sample of adults with personality disorders found that perceived rejection and isolation increased in the hours leading up to NSSI and decreased after the behaviour (Snir et al., 2015).

It must be emphasized that not all social consequences of NSSI are desirable, however. At least one third (36%) of young adults with a history of NSSI report that their self-injury has instigated fights with their friends or family (Klonsky, 2009), and roughly one in five report that their relationships have suffered because of their NSSI (21%) or believe that their social life would be better if they did not self-injure (23%; Burke et al., 2017). In a prospective study of adolescent girls, baseline NSSI predicted more social stress six months later, whereas baseline NSSI did not predict later experiences of non-social stressors, suggesting that engagement in NSSI may be uniquely related to deterioration in relationships (Burke et al., 2015). Finally, Baetens et al. (2015) found that adolescent NSSI predicted increases in both supportive parenting behaviours and harsh parental punishment one year later, highlighting its desirable and undesirable social consequences.

One factor that may underlie the detection of both desirable and undesirable social consequences of NSSI in these studies is the varying timeframes over which these consequences were measured. In the cross-sectional study by Klonsky (2009), for instance, participants were provided with a list of consequences and asked to indicate which had occurred after NSSI, without specifying whether they occurred immediately following the behaviour or after a delay. Similarly, the timeframes were highly variable in the prospective studies, with some examining the social consequences that occurred hours after NSSI (Snir et al., 2015) and others examining the social consequences that occurred months or years later (Baetens et al., 2015; Burke et al., 2015; Hilt et al., 2008). Parallel to the emotional consequences of NSSI, it is possible that NSSI is followed by desirable social consequences in the short-term, but negative reactions from others in the long-

term. NSSI is often viewed as attention-seeking and manipulative by medical professionals, teachers, family members, and peers (Crouch & Wright, 2004; Heath et al., 2006; Rissanen et al., 2008; Wilstrand et al., 2007); thus, the stigma and stereotypes associated with NSSI, as well as the distress experienced by those who are close to the person who self-injures, may exacerbate relationship problems in the long-term despite its immediate benefits. Nevertheless, from an operant conditioning framework, the desirable social consequences that immediately follow NSSI should exert a stronger influence than the unpleasant delayed consequences of NSSI. As such, if NSSI results in an immediate expression of concern or caring, followed by more arguments and tension in the months or years that follow, we would still expect the behaviour to be reinforced.

Linking the Consequences and Severity of NSSI

Consistent with the principle of operant conditioning, behavioural models of NSSI propose that experiencing desirable consequences following NSSI is a key mechanism that increases the intensity/strength of the behaviour (Chapman et al., 2006; Hooley & Franklin, 2018; Nock, 2008; Nock & Prinstein, 2004). Yet, behavioural models of NSSI do not specify whether experiencing more desirable consequences *relative to other people* (i.e., between-person) or experiencing more desirable consequences *relative to one's own average* (i.e., within-person) more strongly predicts NSSI severity. Though not explicitly articulated, the BBM seems to conceptualize desirable NSSI consequences as a between-person risk factor, as it posits that some people experience particularly intense emotional and social benefits of NSSI that render them vulnerable to developing severe NSSI (Hooley & Franklin, 2018). In contrast, the EAM, FFM, and elaborated social functions model of NSSI do not articulate predictions regarding the between- versus within-person influence of desirable NSSI consequences (Chapman et al., 2006; Nock, 2008; Nock & Prinstein, 2004), leaving it unclear which is most relevant to our understanding of NSSI severity. The answer to this

question holds significant clinical importance, however. On the one hand, if desirable NSSI consequences are best conceptualized as a between-person risk factor, then this can identify *who* is most in need of clinical support. On the other hand, if desirable NSSI consequences are best conceptualized as a within-person risk factor, then this can inform *when* clinical interventions should be delivered or augmented by detecting periods of elevated NSSI risk. Accordingly, the following sections will outline what is currently known regarding between- and within-person variability in desirable NSSI consequences, how they relate to NSSI severity, and what research gaps must be addressed to advance the field.

Between-Person Influence of Desirable NSSI Consequences

Thus far, research has largely conceptualized desirable NSSI consequences as a between-person risk factor, with studies demonstrating that people who report more desirable consequences following NSSI also have more severe NSSI histories. For example, a mixed-methods study that incorporated both quantitative and qualitative methodologies found that young adults who had engaged in NSSI multiple times were significantly more likely to report feeling relief following NSSI, relative to those who engaged in NSSI only once (Kakhnovets et al., 2010). In contrast, participants who had engaged in NSSI only once were significantly more likely to report feeling angry before, during, and after NSSI (Kakhnovets et al., 2010). In line with the BBM, one possible explanation of these findings is that people who find NSSI to be a rewarding emotion regulation strategy continue to engage in the behaviour, whereas those who do not feel little inclination to repeat NSSI and turn to another coping strategy instead (Hooley & Franklin, 2018).

Additional support for the between-person influence of desirable NSSI consequences comes from cross-sectional studies showing that people who perceive NSSI to be effective in regulating their emotions have a higher lifetime NSSI frequency (i.e., total number of past NSSI

episodes; Brausch & Muehlenkamp, 2018; Chapman & Dixon-Gordon, 2007; Jenkins & Schmitz, 2012; Klonsky, 2009) and lifetime NSSI versatility (i.e., total number of past NSSI methods; Brausch & Muehlenkamp, 2018). Opposite to behavioural models (Hooley & Franklin, 2018; Nock, 2008; Nock & Prinstein, 2004), however, people who perceive NSSI to be effective in producing desirable social changes have a lower lifetime NSSI frequency and versatility (Brausch & Muehlenkamp, 2018); while the reasons for this finding are unclear, it is possible that the social consequences of NSSI are less reinforcing than initially theorized or that the desire to engage in NSSI is eradicated once interpersonal needs are met. Unfortunately, a limitation of these cross-sectional studies is that they cannot ascertain the direction of these effects, that is, whether desirable NSSI consequences predict NSSI severity or whether NSSI severity predicts desirable NSSI consequences. Longitudinal studies are needed to determine whether experiencing more desirable consequences following NSSI, relative to other people, predicts *future* NSSI severity.

Within-Person Influence of Desirable NSSI Consequences

The field of NSSI has recently experienced an influx in research investigating within-person associations, which can be estimated using microlongitudinal or longitudinal designs that follow the same participants over multiple occasions (Rodríguez-Blanco et al., 2018). Studies at the between-person level can tell us whether individuals who experience more desirable NSSI consequences, relative to those who experience less desirable NSSI consequences, are more likely to exhibit a pattern of severe NSSI engagement. However, they cannot tell us whether experiencing more desirable NSSI consequences, relative to one's own average level of desirable NSSI consequences, influences NSSI severity. Within-person analyses fill this gap by elucidating *when* and *under what conditions* individuals are most likely to exhibit a rise in NSSI frequency or versatility, and as such, are uniquely equipped to identify proximal risk factors of NSSI.

In fact, emerging evidence suggests that within-person fluctuations in desirable NSSI consequences predict the severity of subsequent NSSI. For instance, one recent EMA study found that experiencing decreases in negative emotions following NSSI, relative to one's own mean, predicted increases in NSSI urges and frequency a few hours later (Kranzler et al., 2018). Similarly, experiencing a rise in positive emotions following NSSI, relative to one's own mean, predicted a rise in NSSI urges but was unrelated to NSSI frequency (Kranzler et al., 2018). In other words, when desirable emotional shifts followed NSSI, people experienced urges to repeat NSSI over the ensuing hours. With respect to the desirable social consequences of NSSI, Turner et al. (2016) used a 14-day daily diary to examine the events that led up to and followed NSSI in a sample of community adults; the key finding was that NSSI episodes that had been revealed to others were followed by increases in social support, relative to one's own mean, which in turn predicted stronger NSSI urges and a greater likelihood of engaging in NSSI the next day (Turner et al., 2016). Collectively, these findings suggest that experiencing within-person increases in desirable emotional and social consequences following NSSI predicts repetition of the behaviour.

Research Gaps and Limitations

There is a strong theoretical rationale for expecting the desirable emotional and social consequences of NSSI to predict the severity of future NSSI, with research underscoring the importance of examining both between- and within-person contributions to this association. Nonetheless, there are three limitations of existing research that must be addressed to advance the field. First, previous studies are largely cross-sectional and used "postdiction" (i.e., predicted backwards in time) to examine the association between desirable NSSI consequences and lifetime NSSI frequency or versatility (Brausch & Muehlenkamp, 2018; Chapman & Dixon-Gordon, 2007; Jenkins & Schmitz, 2012; Klonsky, 2009). This makes it impossible to test whether the

consequences of NSSI predict the severity of future NSSI, which is a key proposition of behavioural models. Second, the only two studies that have examined the prospective association between the consequences of NSSI and NSSI engagement used microlongitudinal designs that were confined to brief follow-up periods (i.e., two weeks; Kranzler et al., 2018; Turner et al., 2016). Unfortunately, this limits our understanding of how this relation unfolds over longer periods of time, for instance, over months or years. This is an important research question, however, as identifying long-term predictors of NSSI can provide valuable clues on processes that can be targeted in interventions to produce long-lasting changes in NSSI severity. Finally, existing studies have focused either exclusively on the association between within-person fluctuations or between-person variability in desirable NSSI consequences and NSSI severity, with no studies examining both (Chapman & Dixon-Gordon, 2007; Jenkins & Schmitz, 2012; Klonsky, 2009; Kranzler et al., 2018; Turner et al., 2016). By failing to formally distinguish the impact of between- and within-person variation, existing studies may suffer from biased model estimates and erroneous findings (Hoffman & Stawski, 2009). This is not only a statistical problem, but one that holds implications for theory development and clinical practice. Specifically, disaggregating the between- and within-person processes that predict increases in NSSI severity can: (1) refine behavioural models that currently do not articulate which effect is most relevant to the maintenance of NSSI, (2) improve identification of people who are particularly susceptible to developing severe NSSI, and (3) ameliorate our detection of periods of elevated NSSI risk.

The Present Study

To address the research gaps and limitations of the literature, this study investigated the longitudinal associations between desirable NSSI consequences and two markers of NSSI severity: frequency and versatility. Notably, this study disaggregated the influence of between- and within-

person variation in desirable NSSI consequences on NSSI severity, allowing for a more nuanced investigation of this association than previous research. At the within-person level, I hypothesized that experiencing more desirable emotional consequences of NSSI at Time_T, relative to one's own mean, would predict a rise in NSSI frequency (Hypothesis 1) and NSSI versatility (Hypothesis 2) at Time_{T+1}. Likewise, I hypothesized that experiencing more desirable social consequences of NSSI at Time_T, relative to one's own mean, would predict a rise in NSSI frequency (Hypothesis 3) and NSSI versatility (Hypothesis 4) at Time_{T+1}. At the between-person level, I hypothesized that experiencing more desirable emotional consequences of NSSI, relative to other people in the sample, would predict higher initial and increasing NSSI frequency (Hypothesis 5) and NSSI versatility (Hypothesis 6) over time. I similarly hypothesized that experiencing more desirable social consequences of NSSI, relative to other people in the sample, would predict higher initial and increasing NSSI frequency (Hypothesis 7) and NSSI versatility (Hypothesis 8) over time.

Methods

Participants

Participants were 210 adolescents and adults (93.81% female; $M_{\text{age}} = 22.95$ [$SD = 7.17$, range = 16-57]) who reported at least one episode of NSSI in their lifetime. Most participants were White (92.86%) and resided in the United States (51.43%), Canada (17.62%), United Kingdom (12.38%), or Australia (7.14%). Other countries of residence in this sample included Belgium, Denmark, Finland, Germany, Greece, Israel, Italy, Japan, Mexico, Netherlands, New Zealand, Russia, Scotland, South Africa, and Thailand. Many participants reported an annual household income of less than \$50,000 (49.05%). Full demographic information is displayed in Table 1.

Table 1

Demographic Characteristics of the Sample

	<i>n</i> (%)
Gender	
<i>Female</i>	197 (93.81)
<i>Male</i>	13 (6.19)
Country of Residence	
<i>United States</i>	108 (51.43)
<i>Canada</i>	37 (17.62)
<i>United Kingdom</i>	26 (12.38)
<i>Australia</i>	15 (7.14)
<i>Other</i>	24 (11.42)
Ethnicity	
<i>White, Eastern European, or Western European</i>	195 (92.86)
<i>Asian, Chinese, or Japanese</i>	5 (2.38)
<i>Black, African, or Caribbean</i>	7 (3.33)
<i>Aboriginal, First Nations, Inuit, or Métis</i>	2 (0.95)
<i>South Asian, East Indian, or Pakistani</i>	2 (0.95)
<i>South-East Asian, Vietnamese, or Filipino</i>	1 (0.48)
<i>Other</i>	9 (4.29)
Annual Household Income	
> \$100,000	22 (10.48)
\$50,000-99,999	33 (15.71)
\$35,000-49,999	40 (19.05)
< \$34,999	63 (30.00)
<i>Prefer not to respond</i>	52 (24.76)

Note. Participants could endorse more than one ethnicity.

Procedures

All procedures of the original study were approved by the Research Ethics Board at Simon Fraser University and secondary analysis of this dataset was approved by the Research Ethics Board at the University of Victoria. Participants were recruited from NSSI communities on popular social networking websites such as Facebook.com, Livejournal.com, and Daily-strength.org. Advertisements were posted on these community e-forums inviting participants to partake in an online study examining “...*how emotions, life experiences, stress, and coping styles affect self-harm*”. Individuals who were interested in participating were e-mailed the informed consent information along with a link and password for the online survey portal. After providing informed consent, participants completed a baseline assessment comprised of a battery of surveys that took approximately two hours to complete.

Of the 210 participants who completed the baseline assessment, 197 expressed interest in completing the follow-up portion of the study, with surveys re-administered every three months for two years. These participants were e-mailed one week prior to each re-assessment date and sent weekly reminder e-mails until they completed the follow-up or indicated they were no longer interested. Participants could skip a follow-up and remain eligible to complete the next follow-up. To manage any distress from the surveys, participants completed a soothing online game at the end of each assessment and were provided with the contact information of several international crisis hotlines. As compensation, participants received \$5-10 gift certificates for Amazon.com or PayPal.com for each time point completed and a \$20-25 bonus for completing all time points. Although this study lasted two years, I restricted analyses to the first year (i.e., first five time points) due to significant attrition in the sample (see the Missing Data and Attrition section).

Measures

Desirable NSSI Consequences

Desirable NSSI consequences were assessed at baseline and at each follow-up assessment using a series of items adapted from the Suicide Attempt Self-Injury Interview (SASII; Linehan et al., 2006; see Appendix A). The SASII was originally developed as a structured interview that gathers detailed information on the context, severity, functions, and consequences of suicidal behaviour and NSSI. In this study, the SASII was modified to be a self-report questionnaire pertaining only to NSSI. Participants were asked, “*Did any of the things on the following list happen to you immediately following your self-injury?*”, followed by a list of 29 consequences of NSSI. Participants rated the extent to which they experienced each consequence on a scale ranging from 1 = “*Not true/did not happen at all*” to 5 = “*Very true/happened a lot*”. Examples of consequences included, “*Bad feelings stopped*”, “*You experienced relief from a terrible state of mind*”, and “*Other people treated you better*”. While the psychometric properties of the SASII consequence items have never been investigated, the full measure has shown good inter-rater reliability and validity in clinical inpatients (Linehan et al., 2006). For this study, I used an exploratory factor analysis (EFA; see the Planned Analyses section) to examine the factor structure of the 29 SASII consequence items. Once the factor structure was established, I calculated mean scores for each subscale, such that higher scores reflected more desirable NSSI consequences.

NSSI Frequency

The Questionnaire for Nonsuicidal Self-Injury (QNSSI; Kleindienst et al., 2008) is a 34-item self-report survey that assesses the frequency, methods, emotional experiences, and motives for NSSI. Originally in German, the QNSSI was translated into English by Turner et al. (2012) using two rounds of forward and backward translations to ensure fidelity to the measure. This

study used two items from the QNSSI: the first assessed lifetime NSSI frequency (at baseline) and the second assessed past three-month NSSI frequency (at baseline and follow-ups; see Appendix B). Participants were asked “*How often have you hurt yourself on average over your lifetime?*”, with responses coded as 0 = “*I haven’t hurt myself in my lifetime*”, 1 = “*Once a month or less often*”, 2 = “*2-3 times a month*”, 3 = “*1-2 times a week*”, 4 = “*3-6 times a week*”, and 5 = “*Daily or more than once a day*”. Next, participants were asked: “*How often have you hurt yourself on average in the past three months?*”, with responses coded as 0 = “*I haven’t hurt myself in the past three months*”, 1 = “*Once a month or less often*”, 2 = “*2-3 times a month*”, 3 = “*1-2 times a week*”, 4 = “*3-6 times a week*”, and 5 = “*Daily or more than once a day*”.

NSSI Versatility

The Deliberate Self-Harm Inventory (DSHI; Gratz, 2001) is a self-report survey that assesses the characteristics of 17 different NSSI methods (e.g., cutting, burning, hitting), including the frequency, age of onset, recency, and medical severity of each method. The DSHI was added to this study after recruitment had begun, and as such, baseline DSHI data were only available for 145 (69.05%) participants. At baseline, the DSHI referred to lifetime experiences of each NSSI method, whereas at the follow-up assessments, the DSHI referred to experiences of each NSSI method in the past three months (see Appendix C). I used the DSHI to index NSSI versatility (i.e., total number of NSSI methods) due to the broader range of methods that it measures relative to the QNSSI. Each NSSI method was coded as 0 = “*No*” and 1 = “*Yes*”, such that a versatility score could be created by summing across all 17 methods. The DSHI has shown good internal consistency (Cronbach’s $\alpha = .82$), high test-retest reliability over two to four-weeks ($r = .92$), and adequate construct, convergent, and discriminant validity (Gratz, 2001). In this study, the NSSI versatility scores had modest internal consistency at each time point (Cronbach’s $\alpha = .52-.62$).

Planned Analyses

Exploratory Factor Analysis of Desirable NSSI Consequences

I first performed an EFA on the 29 items assessing desirable NSSI consequences in the baseline data to determine whether creating subscales was warranted given the underlying factor structure of the adapted SASII items. I chose to conduct an EFA rather than a confirmatory factor analysis (CFA) for two main reasons. First, to my knowledge, the factor structure of the SASII consequence items has never been explored. Thus, there was very little basis for specifying a priori the factor structure, item loadings, and correlations as required in a CFA. Second, theory and research support the existence of between one and four broad categories of NSSI consequences: desirable internal consequences (Chapman et al., 2006), desirable emotional and social consequences (Klonsky & Glenn, 2009; Klonsky et al., 2015), and negatively reinforcing emotional, positively reinforcing emotional, negatively reinforcing social, and positively reinforcing social, consequences (Nock & Prinstein, 2004). Given these competing theories, I selected an EFA as a reasonable method of determining how to group the items of the SASII.

Before performing the EFA, I conducted Shapiro-Wilk's test of multivariate normality on the 29 NSSI consequence items to determine which factor extraction method to use. Fabrigar et al. (1999) recommend using maximum likelihood extraction if data are normally distributed because it allows for the computation of goodness of fit indices, as well as statistical significance testing of factor loadings and correlations among factors. If the assumption of multivariate normality is violated, however, Fabrigar et al. (1999) recommend using principal axis factoring extraction. Once I determined which extraction method to use, I performed an initial EFA with oblique rotation to identify and remove items that had communalities (i.e., the extent to which an item correlates with all other items) less than .4. I chose oblique rotation, rather than orthogonal rotation,

because measures of similar constructs (e.g., NSSI motives) tend to have subscales that are moderately to strongly correlated ($r_s = .34-.57$; Klonsky et al., 2015; Nock & Prinstein, 2004) and initial reading suggested that several of the NSSI consequence items were inextricably linked to one another (e.g., “*Other people treated you better*”, “*Feelings of aloneness, emptiness, or isolation stopped*”). Once items with low communalities were removed, I repeated the EFA with oblique rotation. In addition to using the Kaiser rule (eigenvalues > 1) and scree plot to guide factor retention, I only retained factors that had at least three items with factor loadings greater than .4 to prevent subscales with poor item representation and removed items that loaded greater than .4 on more than one factor to increase the discrimination of scales (Costello & Osbourne, 2005).

Variable Distributions

As a next step in exploring the data, I investigated the distributions of all study variables (i.e., desirable NSSI consequences, NSSI frequency, NSSI versatility) that would be included in the hierarchical linear models (HLMs) using descriptive statistics, histograms, Q-Q plots, and Shapiro-Wilk’s tests of univariate normality. West et al. (1995) propose that an absolute skew greater than two and an absolute kurtosis greater than seven indicates a substantial departure from the normal distribution. That said, HLM is relatively robust to violations of the normal distribution, especially when robust standard errors are used to correct for model misspecifications by conservatively adjusting parameter estimates (Maas & Hox, 2004). Therefore, I planned to use robust standard errors to interpret the HLMs if the data departed from the normal distribution.

Missing Data and Attrition

A final set of preliminary analyses evaluated the extent and pattern of missing data and attrition in the sample. First, I performed Little’s Missing Completely at Random test (MCAR; Little, 1988) to investigate patterns of missing data in my independent variable (i.e., desirable

NSSI consequences) and dependent variables (i.e., NSSI frequency, NSSI versatility). This was an imperative step because nonrandomly missing data can severely limit the generalizability of results (Tabachnick & Fidell, 2013). Second, I conducted a series of t-tests and chi-square tests to identify whether participant demographics (i.e., age, gender) and lifetime NSSI frequency were related to attrition (i.e., completion of only the baseline assessment versus at least one follow-up). Simulation studies indicate that statistical techniques based on maximum likelihood estimation, such as HLM, produce unbiased parameter estimates when data are missing at random or completely at random (Black et al., 2012). This is especially true when variables that are related to missingness are included as covariates. Thus, variables related to attrition were included as covariates in all HLMs.

Hierarchical Linear Modeling

I tested my hypotheses using HLM for three main reasons. First, given that participants were assessed repeatedly over multiple time points, observations are nested within individuals and the data cannot be assumed to meet the assumption of independence (Hoffman & Stawski, 2009; Peugh, 2010). HLM can account for the nested structure of the data, thereby reducing the likelihood of Type I errors and biased parameter estimates (Hoffman & Stawski, 2009; Peugh, 2010). Second, HLM has advantages over traditional regression-based statistical techniques such as repeated-measures analysis of variance (RM-ANOVA) and multiple regression because participants with missing follow-up data can still contribute to parameter estimates via full information maximum likelihood estimation (Black et al., 2012). By using all available data without participant deletion, HLM minimizes biased parameter estimates and maximizes statistical power (Black et al., 2012). Finally, HLM allows for the disaggregation of within-person effects (i.e., level-1 model parameters) and between-person effects (i.e., level-2 model parameters; Hoffman & Stawski, 2009), which was central to addressing the hypotheses of this study.

Before proceeding with HLM, I calculated the intraclass correlation coefficients (ICCs) for my dependent variables to assess whether there was enough within-person variability to warrant this approach. To obtain the ICCs, I ran two fully unconditioned HLMs where NSSI frequency at Time_{T+1} (see Equation 1) or NSSI versatility at Time_{T+1} (see Equation 2) were modeled as dependent variables without any predictors. The ICC indicates the proportion of the total variance in the dependent variable that is at the between-person level, such that a value closer to one means there is more variance at the between-person level (see Equation 3; Peugh, 2010). In addition, I computed the design effects from the NSSI frequency and NSSI versatility ICCs to gauge the extent to which standard errors would be incorrectly estimated by ignoring the nested structure of the data (see Equation 4). HLM is necessary to account for nested data if the design effects exceed two.

Level-1 Equation:

$$\text{NSSI Frequency}_{T+1} = \pi_{0i} + e_{ij} \quad (1)$$

Level-2 Equation:

$$\pi_{0i} = \beta_{00} + u_{01}$$

Level-1 Equation:

$$\text{NSSI Versatility}_{T+1} = \pi_{0i} + e_{ij} \quad (2)$$

Level-2 Equation:

$$\pi_{0i} = \beta_{00} + u_{01}$$

$$\text{ICC} = \tau_{00} / (\tau_{00} + \sigma^2)$$

$$\tau_{00} = \text{Level-2/between-person variance} \quad (3)$$

$$\sigma^2 = \text{Level-1/within-person variance}$$

$$\text{Design Effect} = 1 + (n_c - 1)\text{ICC}$$

$$n_c = \text{average number of level-1 observations per participant} \quad (4)$$

I fit the HLMs used to test my hypotheses on HLM version 8 (Raudenbush et al., 2019). To test Hypotheses 1 through 4, I constructed two time-lagged HLMs examining the associations between desirable NSSI consequences at one time point (Time_T) and NSSI frequency or versatility

at the next time point (Time_{T+1}). Four lags were included: T1 to T2, T2 to T3, T3 to T4, and T4 to T5. In the HLMs, NSSI frequency or versatility at Time_{T+1} was modeled as a function of lagged time (Time_{T+1}), NSSI frequency or versatility at Time_T (to account for the autocorrelation between NSSI frequency or versatility at Time_T and Time_{T+1}), and desirable NSSI consequences at Time_T , with each of the NSSI consequence subscales indicated by the EFA entered into the same model. Level-1 predictors were group-mean centered (i.e., centered around each person's own mean) so that the resulting coefficients reflected the extent to which people deviated from their own average level of NSSI consequences at any given time point. Time was centered at baseline, with each unit change reflecting the time between follow-up surveys (i.e., 0 = T1, 1 = T2, 2 = T3, etc.). All variables were z-scored prior to entry into the HLMs, meaning that scores on each variable reflected a person's relative standing to the sample expressed in standard deviation units.

To test Hypotheses 5 through 8, each participant's mean score on desirable NSSI consequences across time points (i.e., person-mean NSSI consequences) was grand-mean centered (i.e., centered around the sample's mean) and entered as a level-2 predictor in the HLMs. This represented the extent to which people differed in their mean level of desirable NSSI consequences across the one-year study period relative to other participants. Including NSSI consequences at level-1 and level-2 accounted for the within-person effect of NSSI consequences (i.e., experiencing more NSSI consequences at a given time point relative to one's own mean) and the between-person effect of NSSI consequences (i.e., experiencing more NSSI consequences than other people). All HLMs included random effects for level-1 and level-2 predictors to allow for between-person variability in slopes and intercepts. Finally, lifetime NSSI frequency was added as a level-2 covariate because NSSI consequences may exert a weaker influence on NSSI severity once NSSI has become an overlearned response through repeated engagement (Chapman et al., 2006).

Results

NSSI Characteristics of the Sample

Most participants reported two to three episodes of NSSI per month ($M = 2.80$, $SD = 1.43$) and using multiple NSSI methods ($M = 6.19$, $SD = 2.66$) over their lifetime. The most common NSSI methods were cutting one's wrists, arms, or other areas of the body (93.10%), carving words into the skin (66.90%), and severe scratching that causes scarring or bleeding (63.45%; see Table 2). Most participants (53.10%) had been hospitalized or required medical treatment following NSSI at least once. Moreover, participants endorsed multiple desirable NSSI consequences, with an average of 18.13 ($SD = 4.39$) consequences rated as at least somewhat relevant (see Table 3).

Table 2

Rate of Endorsement of Lifetime NSSI Methods at Baseline

	<i>n (%)</i>
Cut your wrist, arms, or other area(s) of your body	135 (93.10)
Carved words into your skin	97 (66.90)
Severely scratched yourself to the extent that scarring or bleeding occurred	92 (63.45)
Stuck sharp objects (e.g., needles, pins, staples, etc.) into your skin, not including tattoos, ear piercings, needles used for drug use, or body piercings	82 (56.55)
Prevented wounds from healing	81 (55.86)
Carved pictures, designs, or other marks into your skin	68 (46.90)
Punched yourself to the extent that you caused a bruise	59 (40.69)
Burned yourself with a lighter or a match	51 (35.17)
Banged your head against something to the extent that you caused a bruise	42 (28.97)
Burned yourself with a cigarette	36 (24.83)
Bit yourself to the extent that you broke the skin	34 (23.45)
Rubbed glass into your skin	19 (8.97)
Used bleach, comet, or oven cleaner to scrub your skin	13 (8.97)
Rubbed sandpaper on your body	11 (7.59)
Dripped acid on your skin	9 (6.21)
Broken your own bones	8 (5.52)
Other	60 (41.38)

Note. Baseline data on lifetime NSSI methods was only available for 145 (69.05%) participants.

NSSI = nonsuicidal self-injury.

Table 3*Rate of Endorsement of Desirable NSSI Consequences at Baseline*

	<i>n</i> (%)	<i>M</i>	<i>SD</i>
You experienced relief from a terrible state of mind*	196 (93.33)	3.75	1.13
Feelings of anger, frustration, or rage stopped*	190 (90.48)	3.40	1.17
You felt something, even if it was pain	190 (90.48)	4.00	1.24
You were distracted from other problems	185 (88.10)	3.66	1.27
Your self-injury expressed your anger or frustration	184 (88.10)	3.51	1.32
Bad feelings stopped*	182 (86.67)	3.31	1.25
Feelings of anxiety or terror stopped*	177 (84.29)	3.18	1.32
You felt punished or succeeded in punishing yourself	177 (84.29)	3.48	1.39
You stopped feeling numb or dead*	175 (83.33)	3.33	1.33
Feelings of aloneness, emptiness, or isolation stopped*	171 (81.43)	2.88	1.23
Feelings of sadness stopped*	168 (80.00)	2.72	1.21
You felt worse about yourself or more self-hatred/shame	167 (79.52)	3.00	1.39
You stopped feeling empty inside, as if you were unreal or disconnected from your feelings*	162 (77.14)	3.02	1.37
You got away or escaped	159 (75.71)	3.03	1.40
Feelings of depression stopped*	144 (68.57)	2.31	1.23
Feelings of self-hatred or shame stopped*	143 (68.10)	2.38	1.21
You prevented yourself from being hurt in a worse way	137 (65.24)	2.54	1.42
You proved to yourself that things really were bad	126 (60.00)	2.20	1.28
You got a vacation from having to try so hard	107 (50.95)	2.16	1.36
It gave you something, anything to do	103 (49.05)	2.11	1.32
Others understood how desperate you are/were	89 (42.38)	1.76	1.07
You got help	82 (39.05)	1.61	0.86
You shocked or impressed others*	58 (27.62)	1.47	0.90
You got back at or hurt someone*	53 (25.24)	1.44	0.93
You gained admission to a hospital or treatment program	52 (24.76)	1.49	0.99
Other people were better off than before you harmed yourself	43 (20.48)	1.50	1.11
You got out of doing something	43 (20.48)	1.40	0.95
Other people treated you better*	34 (16.19)	1.27	0.70
Others realized how wrong they are/were*	34 (16.19)	1.28	0.75

Note. The rate of endorsement was calculated based on the proportion of participants who rated each consequence as at least somewhat relevant. An asterisk (*) has been placed beside items that were included in the NSSI consequence subscales. NSSI = nonsuicidal self-injury; *M* = mean; *SD* = standard deviation.

Exploratory Factor Analysis of Desirable NSSI Consequences

The Shapiro-Wilk's test of multivariate normality revealed that the 29 items measuring desirable NSSI consequences were not normally distributed ($p < .001$). This led me to select principal axis factoring rather than maximum likelihood extraction for the EFA (Fabrigar et al., 1999). The initial principal axis factoring with oblique rotation revealed 13 items with low communalities ($< .4$). These items were removed and the remaining 16 items were re-entered into the EFA. The Kaiser-Meyer-Olkin coefficient suggested adequate sampling adequacy ($KMO = .85$) and Bartlett's test of sphericity indicated that the correlations between items were sufficiently large for principal axis factoring ($\chi^2[120] = 1283, p < .001$). The initial solution revealed that four factors had eigenvalues greater than one, which together accounted for 63.40% of the variance.

Visual inspection of the scree plot revealed two inflection points, however, making it difficult to discern whether two or four factors should be retained (see Figure 1). Based on Costello and Osborne's (2005) recommendations for dealing with ambiguous scree plots, I ran several EFAs with principal axis factoring and set the number of factors to retain manually – first using the number of factors suggested by the scree plot (i.e., two and four), followed by the numbers above and below the number of factors suggested by the scree plot (i.e., one, three, and five). Then, I compared the pattern matrices to identify which solution had the cleanest factor structure, that is, the solution with the most item loadings above .4, the least items with cross-loadings, and no factors with fewer than three items. The solution with two factors met these criteria and explained 47.15% of the variance. I therefore retained this solution. Two items were dropped due to low factor loadings and the following scales were identified based on the conceptual content of each factor: desirable emotional consequences (n items = 10) and desirable social consequences (n items = 4). The items of each subscale, as well as their factor loadings, are displayed in Table 4.

Figure 1

Scree Plot of the Exploratory Factor Analysis

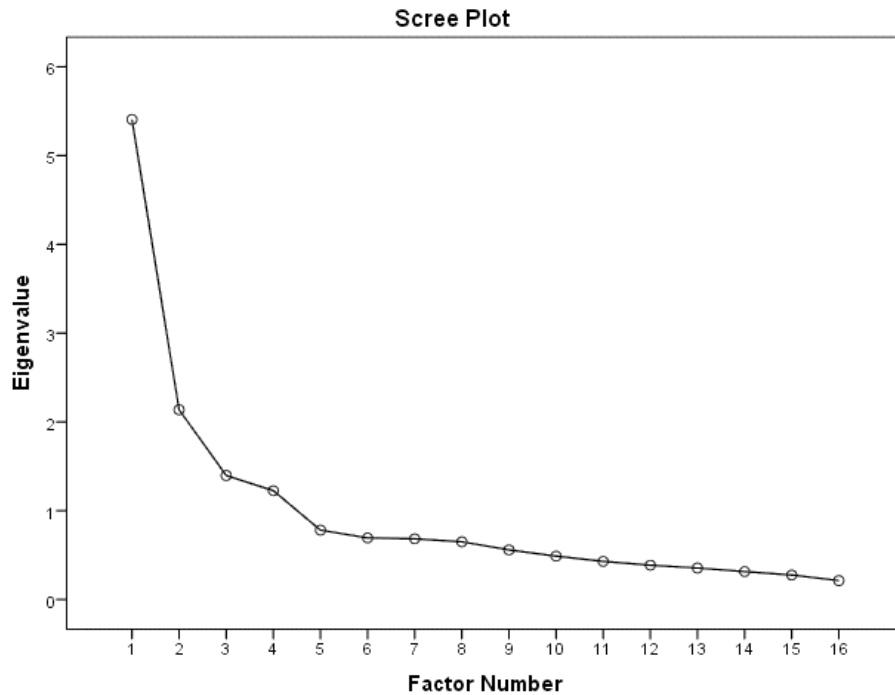


Table 4

Emotional and Social Consequences of NSSI Subscales with Factor Loadings

Emotional Consequences

Bad feelings stopped (.71)

You stopped feeling numb or dead (.46)

Feelings of anger, frustration, or rage stopped (.59)

Feelings of anxiety or terror stopped (.62)

Feelings of aloneness, emptiness, or isolation stopped (.75)

Feelings of self-hatred or shame stopped (.70)

You experienced relief from a terrible state of mind (.71)

Feelings of sadness stopped (.83)

You stopped feeling empty inside, as if you were unreal or disconnected from your feelings (.67)

Feelings of depression stopped (.69)

Social Consequences

You shocked or impressed others (.52)

Other people treated you better (.74)

You got back at or hurt someone (.68)

Others realized how wrong they are/were (.49)

Note. NSSI = nonsuicidal self-injury.

After creating subscale scores by computing the mean of the emotional and social consequence items at each time point, I examined the internal consistencies and bivariate correlations of these subscales. The emotional consequences subscale had good to excellent internal consistency (Cronbach's α s = .80-.93) and the social consequences subscale had modest to good internal consistency (Cronbach's α s = .69-.83) at each time point (see Table 5). The bivariate correlations between the emotional and social consequences subscales at each time point ranged from small and negative to moderate and positive (r s = -.07 to .28; see Table 6).

Table 5

Descriptive Statistics of Desirable NSSI Consequences at Each Time Point

Variable	α	Min	Max	M	SD	Skewness		Kurtosis	
						Statistic	SE	Statistic	SE
T1 Emotional Consequences	.89	0	5	3.04	0.88	-0.15	.17	-0.48	.34
T1 Social Consequences	.69	0	5	1.37	0.59	2.46	.17	8.24	.34
T2 Emotional Consequences	.93	0	5	2.79	0.90	0.31	.25	-0.11	.50
T2 Social Consequences	.79	0	5	1.36	0.52	1.56	.26	1.93	.51
T3 Emotional Consequences	.80	0	5	2.84	0.81	0.03	.28	0.23	.55
T3 Social Consequences	.80	0	5	1.29	0.48	2.16	.28	4.89	.55
T4 Emotional Consequences	.91	0	5	2.72	0.77	-0.06	.30	-0.69	.59
T4 Social Consequences	.70	0	5	1.41	0.61	1.60	.30	1.60	.60
T5 Emotional Consequences	.93	0	5	2.78	0.76	0.18	.40	-0.79	.79
T5 Social Consequences	.83	0	5	1.32	0.59	2.08	.33	4.00	.66

Note. NSSI = nonsuicidal self-injury; α = Cronbach's alpha; Min = minimum value in the scale;

Max = maximum value in the scale; M = mean; SD = standard deviation; SE = standard error.

Table 6*Bivariate Correlations Between Desirable NSSI Consequences at Each Time Point*

	1	2	3	4	5	6	7	8	9	10
1. T1 Emotional Consequences	1									
2. T1 Social Consequences	.01	1								
3. T2 Emotional Consequences	.58**	.04	1							
4. T2 Social Consequences	-.01	.60**	.13	1						
5. T3 Emotional Consequences	.36**	.08	.62**	.08	1					
6. T3 Social Consequences	.15	.61**	.16	.70**	.23*	1				
7. T4 Emotional Consequences	.55**	.04	.66**	.10	.58**	.07	1			
8. T4 Social Consequences	.01	.53**	.02	.60**	-.07	.62**	-.001	1		
9. T5 Emotional Consequences	.36*	.18	.73**	.25	.52**	.18	.81**	.16	1	
10. T5 Social Consequences	.07	.50**	.17	.87**	.13	.75**	.28	.78**	.21	1

Note. NSSI = nonsuicidal self-injury. * $p < .05$; ** $p < .01$.

Variable Distributions

According to established cut-offs (West et al., 1995), desirable emotional consequences (Skewness = -0.15 to 0.31, Kurtosis = -0.79 to 0.23; see Table 5), NSSI frequency (Skewness = 0.29 to 0.76, Kurtosis = -0.12 to -0.92; see Table 7), and NSSI versatility (Skewness = 0.2 to 1.38, Kurtosis = -0.13 to 2.12; see Table 8) were normally distributed at each time point. Yet, desirable social consequences were not normally distributed at T1, T3, and T5 (Skewness = 2.08 to 2.46, Kurtosis = 4.00 to 8.24; see Table 5). Moreover, visual inspection of the histograms and Q-Q plots,

as well as the Shapiro Wilk's test of univariate normality, revealed that these variables significantly deviated from the normal distribution (all $ps < .05$). Given that some of the variables were not normally distributed, I interpreted all HLMs using robust standard errors.

Table 7

Descriptive Statistics of NSSI Frequency at Each Time Point

Variable	Min	Max	<i>M</i>	<i>SD</i>	Skewness		Kurtosis	
					Statistic	<i>SE</i>	Statistic	<i>SE</i>
T1 NSSI Frequency	0	5	1.99	1.49	0.29	0.17	-0.92	0.34
T2 NSSI Frequency	0	5	1.70	1.27	0.46	0.25	-0.17	0.50
T3 NSSI Frequency	0	5	1.68	1.33	0.71	0.28	-0.30	0.55
T4 NSSI Frequency	0	5	1.69	1.36	0.73	0.29	-0.12	0.57
T5 NSSI Frequency	0	5	1.56	1.42	0.76	0.32	-0.23	0.64

Note. NSSI = nonsuicidal self-injury; Min = minimum value in the scale; Max = maximum value in the scale; *M* = mean; *SD* = standard deviation; *SE* = standard error.

Table 8

Descriptive Statistics of NSSI Versatility at Each Time Point

Variable	α	Min	Max	<i>M</i>	<i>SD</i>	Skewness		Kurtosis	
						Statistic	<i>SE</i>	Statistic	<i>SE</i>
T1 NSSI Versatility	.62	0	17	6.19	2.66	0.54	0.20	0.28	0.40
T2 NSSI Versatility	.64	0	17	2.41	1.99	0.86	0.25	0.47	0.50
T3 NSSI Versatility	.52	0	17	2.17	1.73	1.38	0.27	2.12	0.53
T4 NSSI Versatility	.52	0	17	2.23	1.76	0.72	0.29	-0.13	0.57
T5 NSSI Versatility	.59	0	17	2.09	1.84	0.97	0.32	1.11	0.63

Note. T1 refers to lifetime NSSI versatility and T2-T4 refer to past three-month NSSI versatility. NSSI = nonsuicidal self-injury; α = Cronbach's alpha; Min = minimum value in the scale; Max = maximum value in the scale; *M* = mean; *SD* = standard deviation; *SE* = standard error.

Missing Data and Attrition

Participants completed an average of 2.38 ($SD = 1.53$) assessments in this study (see Table 9 for the response rate at each time point). Of the 197 individuals who consented to participate in the longitudinal portion of the study, eight participants provided an e-mail address that was invalid by the time of the first follow-up assessment. Of the remaining 189 participants who could be contacted, 117 (61.19%) completed at least one-follow up assessment (see Table 10).

Table 9

Response Rate at Each Time Point

Time Point	<i>n</i>	Response Rate (%)
T2	93	49.20
T3	77	40.74
T4	69	36.51
T5	55	29.10
T6	31	16.40
T7	28	14.81
T8	28	14.81
T9	28	14.81

Note. The response rate was based on the number of participants who completed the QNSSI, DSHI, or SASII, out of those who could be contacted for the follow-up assessments ($n = 189$).

Table 10

Number of Follow-Up Assessments Completed by Participants

Number of Follow-Ups Completed	<i>n</i> (%)
1	93 (49.21)
2	34 (17.99)
3	25 (13.23)
4	24 (12.70)

Note. The percentage of the sample who completed each number of follow-ups was based on the number of follow-up surveys completed by participants, as indicated the QNSSI, DSHI, or SASII, out of the number of participants who could be contacted for the follow-up assessments ($n = 189$).

The MCAR test supported the assumption that the data were missing at random ($\chi^2[496] = 505.23, p = .377$). Furthermore, comparing participants who provided baseline data only to those who completed at least one follow-up assessment revealed no significant differences with respect to gender ($\chi^2[1] = 1.03, p = .311$) or lifetime NSSI frequency ($t[208] = 0.23, p = .816$); however, participants who completed only the baseline survey were significantly younger ($t[207] = -3.35, p = .001$) than those who completed at least one follow-up assessment. Thus, in addition to lifetime NSSI frequency, I included age as a covariate in the HLMs. The HLM equation predicting NSSI frequency at Time_{T+1} is displayed in Equation 5 and the HLM equation predicting NSSI versatility at Time_{T+1} is displayed in Equation 6.

Level-1 Equation:

$$\text{NSSI Frequency}_{T+1} = \pi_{0i} + \pi_{1i}(\text{Time}_{T+1}) + \pi_{2i}(\text{Emotional Consequences}_T) + \pi_{3i}(\text{Social Consequences}_T) + \pi_{4i}(\text{NSSI Frequency}_T) + e_{ij}$$

Level-2 Equation:

$$\begin{aligned} \pi_{0i} &= \beta_{00} + \beta_{01}(\text{Emotional Consequences}) + \beta_{02}(\text{Social Consequences}) + \beta_{03}(\text{Lifetime NSSI Frequency}) + \beta_{04}(\text{Age}) + u_{0i} \\ \pi_{1i} &= \beta_{10} + \beta_{11}(\text{Emotional Consequences}) + \beta_{12}(\text{Social Consequences}) + u_{1i} \\ \pi_{2i} &= \beta_{20} + u_{2i} \\ \pi_{3i} &= \beta_{30} + u_{3i} \\ \pi_{4i} &= \beta_{40} + u_{4i} \end{aligned} \quad (5)$$

Level-1 Equation:

$$\text{NSSI Versatility}_{T+1} = \pi_{0i} + \pi_{1i}(\text{Time}_{T+1}) + \pi_{2i}(\text{Emotional Consequences}_T) + \pi_{3i}(\text{Social Consequences}_T) + \pi_{4i}(\text{NSSI Versatility}_T) + e_{ij}$$

Level 2 Equation:

$$\begin{aligned} \pi_{0i} &= \beta_{00} + \beta_{01}(\text{Emotional Consequences}) + \beta_{02}(\text{Social Consequences}) + \beta_{03}(\text{Lifetime NSSI Frequency}) + \beta_{04}(\text{Age}) + u_{0i} \\ \pi_{1i} &= \beta_{10} + \beta_{11}(\text{Emotional Consequences}) + \beta_{12}(\text{Social Consequences}) + u_{1i} \\ \pi_{2i} &= \beta_{20} + u_{2i} \\ \pi_{3i} &= \beta_{30} + u_{3i} \\ \pi_{4i} &= \beta_{40} + u_{4i} \end{aligned} \quad (6)$$

Nested Structure of the Data

The ICC for NSSI frequency at Time_{T+1} was .53, indicating that 53.00% of the variance in NSSI frequency at Time_{T+1} occurred at the between-person level. The ICC of NSSI versatility at Time_{T+1} was .54, indicating that 54.00% of the variance in NSSI versatility at Time_{T+1} occurred at the between-person level. HLM was therefore justified given that approximately half of the variance in the dependent variables was at the within-person level. Moreover, the design effects were 3.12 for NSSI frequency at Time_{T+1} and 3.16 NSSI versatility at Time_{T+1}, which met the threshold of two that is commonly used to justify HLM (Peugh, 2010).

Primary Analyses

At the within-person level, desirable emotional consequences of NSSI at Time_T were unrelated to NSSI frequency at Time_{T+1} ($\beta = .08, SE = .08, p = .281$) but predicted a rise in NSSI versatility at Time_{T+1} ($\beta = .20, SE = .06, p = .002$). In addition, desirable social consequences of NSSI at Time_T predicted a decrease in NSSI frequency at Time_{T+1} ($\beta = -.17, SE = .08, p = .028$), but were unrelated to NSSI versatility at Time_{T+1} ($\beta = -.01, SE = .10, p = .112$). At the between-person level, desirable emotional consequences of NSSI did not predict NSSI frequency ($\beta = .01, SE = .12, p = .942$) and NSSI versatility ($\beta = .21, SE = .13, p = .121$) at the intercept, nor did it moderate the rate of change in NSSI frequency ($\beta = .04, SE = .04, p = .422$) and NSSI versatility ($\beta = -.01, SE = .05, p = .860$) over time. Likewise, desirable social consequences of NSSI did not predict NSSI frequency ($\beta = -.10, SE = .12, p = .442$) and NSSI versatility ($\beta = .05, SE = .14, p = .731$) at the intercept, nor did it moderate the rate of change in NSSI frequency ($\beta = .01, SE = .04, p = .751$) and NSSI versatility ($\beta = -.05, SE = .05, p = .337$) over time. The HLM outputs are displayed in Tables 11 and 12. Graphical depictions of the within-person relation between NSSI consequences and NSSI frequency or NSSI versatility are displayed in Figures 2 and 3.

Table 11*Hierarchical Linear Modeling Output for NSSI Frequency*

	β	<i>SE</i>	<i>t</i>	<i>p</i>
NSSI Frequency _{T+1} Intercept β_{00}	.04	.12	.37	.711
x Between-Person Emotional Consequences β_{01}	.01	.12	.07	.942
x Between-Person Social Consequences β_{02}	-.10	.12	-.78	.442
x Lifetime NSSI Frequency β_{03}	.16	.09	1.70	.092
x Age β_{04}	-.08	.05	-1.67	.099
Time _{T+1} β_{10}	-.005	.04	-.11	.913
x Between-Person Emotional Consequences β_{11}	.04	.04	.81	.422
x Between-Person Social Consequences β_{12}	.01	.04	.318	.751
Within-Person Emotional Consequences _T β_{20}	.08	.08	1.09	.281
Within-Person Social Consequences _T β_{30}	-.17	.08	-2.23	.028
NSSI Frequency _T β_{40}	-.16	.06	-2.73	.008

Note. NSSI = nonsuicidal self-injury; β = standardized beta; *SE* = standard error.

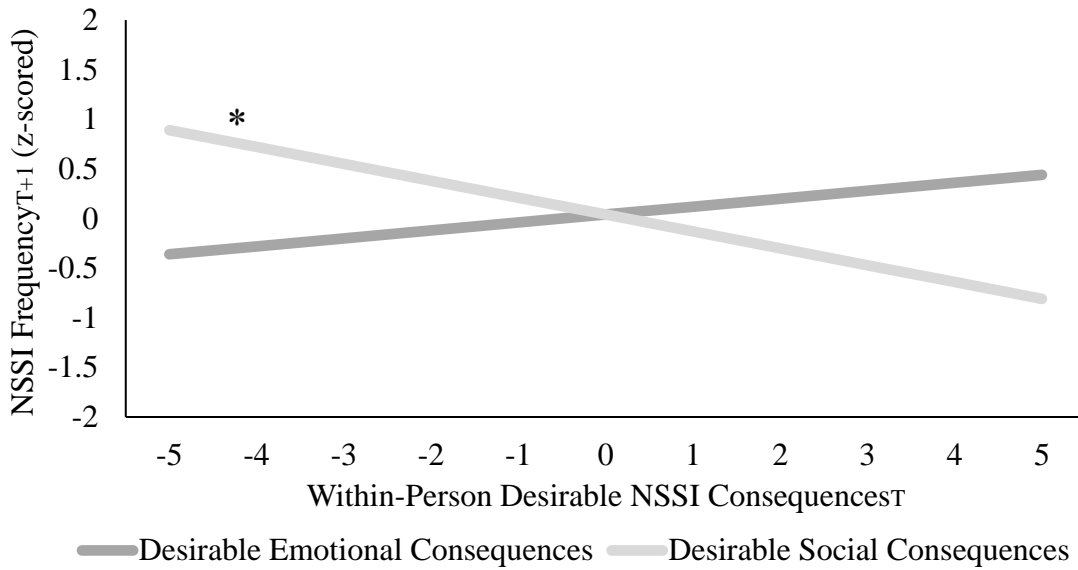
Table 12*Hierarchical Linear Modeling Output for NSSI Versatility*

	β	<i>SE</i>	<i>t</i>	<i>p</i>
NSSI Versatility _{T+1} Intercept β_{00}	.08	.13	.60	.550
x Between-Person Emotional Consequences β_{01}	.21	.13	1.56	.121
x Between-Person Social Consequences β_{02}	.05	.14	.35	.731
x Lifetime NSSI Frequency β_{03}	.01	.08	.16	.872
x Age β_{04}	-.17	.07	-2.60	.011
Time _{T+1} β_{10}	.01	.05	.11	.910
x Between-Person Emotional Consequences β_{11}	-.01	.05	-.18	.860
x Between-Person Social Consequences β_{12}	-.05	.05	-.96	.337
Within-Person Emotional Consequences _T β_{20}	.20	.06	3.17	.002
Within-Person Social Consequences _T β_{30}	-.01	.10	-1.61	.112
NSSI Versatility _T β_{40}	-.27	.05	-5.37	<.001

Note. NSSI = nonsuicidal self-injury; β = standardized beta; *SE* = standard error.

Figure 2

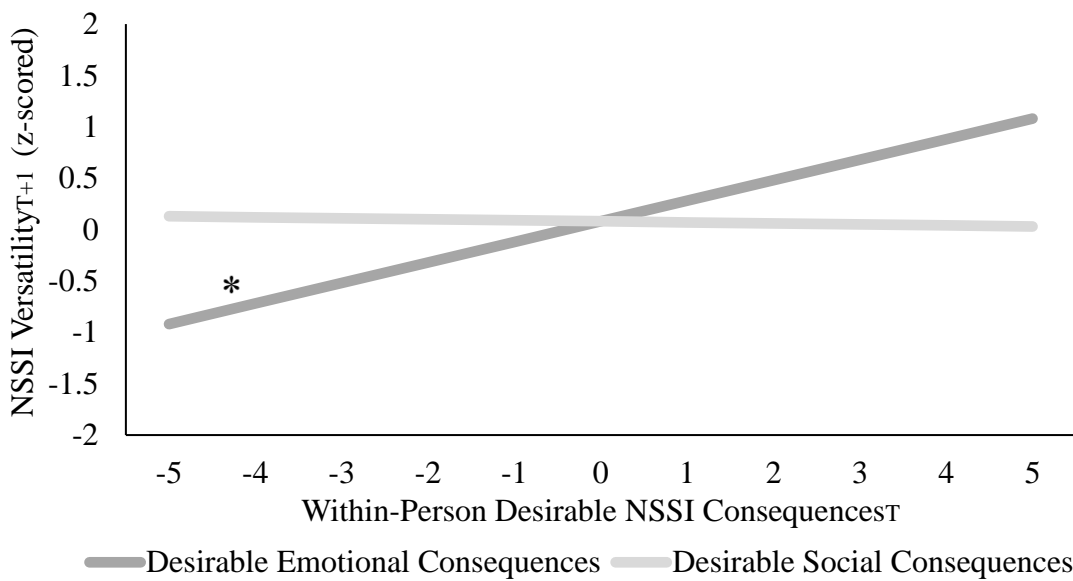
Association Between Desirable NSSI Consequences and NSSI Frequency



Note. This figure illustrates the relation between within-person fluctuations in desirable NSSI consequences and NSSI frequency three months later. NSSI = nonsuicidal self-injury. * $p < .05$.

Figure 3

Association Between Desirable NSSI Consequences and NSSI Versatility



Note. This figure illustrates the relation between within-person fluctuations in desirable NSSI consequences and NSSI versatility three months later. NSSI = nonsuicidal self-injury. * $p < .05$.

Discussion

The results of this study were partially consistent behavioural models of NSSI. Inconsistent with behavioural models, within-person fluctuations in desirable emotional consequences of NSSI were unrelated to NSSI frequency three months later (Hypothesis 1). Yet, as hypothesized, experiencing more desirable emotional consequences following NSSI, relative to one's own mean, predicted a rise in NSSI versatility (Hypothesis 2). Contrary to behavioural models, experiencing more desirable social consequences following NSSI, relative to one's own mean, predicted a decrease in NSSI frequency (Hypothesis 3) and was unrelated to NSSI versatility (Hypothesis 4) three months later. Against Hypotheses 5 through 8, between-person variability in desirable NSSI consequences did not predict higher initial or increasing NSSI frequency or versatility over time.

This study found that when people experienced more desirable emotional consequences than usual following NSSI, such as decreases in anger, sadness, or isolation, they started to use a greater number of methods to self-injure over the subsequent months. Consistent with the behavioural concept of response generalization (Skinner, 1953), experiencing desirable emotional consequences following a given method of NSSI (e.g., cutting) may have led individuals to expect that other methods of NSSI (e.g., hitting, burning) would fulfill the same emotion regulatory function, and as such, resulted in selection of a wider range of methods during ensuing episodes of NSSI. A similar process has been described in the substance use literature to explain why some people develop a pattern of polysubstance use; among a sample of tobacco smokers, for instance, using marijuana to avoid rejection or gain acceptance from peers was related not only to higher marijuana use, but to higher alcohol use (Foster et al., 2015). Likewise, among a sample of heavy drinkers who used tobacco, using alcohol to reduce negative affect was related to holding positive expectancies regarding the emotion-modulating effects of tobacco (Foster et al., 2014). Together,

these findings and the current results suggest that desirable consequences may be a potent predictor of generalization within maladaptive response categories such as NSSI and substance use.

The unexpected finding that desirable emotional consequences were not significantly related to NSSI frequency raises an important question – why versatility and not frequency? One possible explanation is that NSSI versatility is a more salient index of clinical severity than NSSI frequency. Whereas behavioural models of NSSI propose that experiencing desirable consequences following NSSI leads to an increase in the intensity/strength of the behaviour (Chapman et al., 2006; Hooley & Franklin, 2018; Nock, 2008; Nock & Prinstein, 2004), these models do not state how this increase in severity manifests, leaving open the possibility that NSSI could become more frequent, versatile, or both. As such, if NSSI versatility is a more relevant marker of severity than NSSI frequency, then experiencing desirable emotional consequences of NSSI would be expected to lead exclusively to increases in NSSI versatility. In fact, some studies substantiate the greater clinical importance of NSSI versatility by showing that it has a stronger or more robust relation to suicidal behaviour than NSSI frequency (Anestis et al., 2015; Turner et al., 2013). Although future studies should investigate whether the unique link between desirable emotional consequences of NSSI and NSSI versatility can be replicated, the current results suggest that researchers may wish to refine behavioural models of NSSI to explicitly articulate the importance of NSSI versatility as a key outcome shaped by reinforcement processes.

The results of this study diverge from behavioural models with respect to the desirable social consequences of NSSI. When individuals experienced more desirable social consequences than usual following NSSI, such that interpersonal needs for closeness, communication, or distance were met, they experienced subsequent decreases in how often they engaged in NSSI. Although counterintuitive, this finding aligns with previous research showing that the perceived

effectiveness of NSSI in producing desirable social changes is negatively related to lifetime NSSI frequency (Brausch & Muehlenkamp, 2018). When interpreting this finding, it is important to keep in mind that the presence of social consequences following NSSI implies that at least one person in the interpersonal environment was aware of the NSSI. Thus, it may not have been the desirable social consequences per se that led to decreases in NSSI frequency, but a third variable associated with others' awareness of NSSI. For example, perhaps disclosure of NSSI to others, whether intentional or not, facilitated treatment seeking or access to resources; this, in turn, may have reduced the frequency of NSSI by the next time point. Another explanation could be that the desirable social consequences of NSSI are longer-lasting than originally theorized. If a person continues to experience improved relationship quality in the months that follow NSSI, then this may eradicate the desire to repeat NSSI by fulfilling an interpersonal need that was not being met. This interpretation aligns with the behavioural concept of *motivating operations*, which refer to factors that increase (i.e., establishing operations) or decrease (i.e., abolishing operations) the effectiveness of a reinforcer (Laraway et al., 2003). In the context of this study, the desirable social consequences of NSSI may have represented abolishing operations that diminished the reinforcing properties of NSSI, thereby reducing the frequency with which individuals repeated the behaviour.

A final contribution of this study was the finding that within-person fluctuations in desirable NSSI consequences were related to future NSSI severity, whereas between-person variability in these consequences were not. This finding aligns with a burgeoning body of literature showing that within-person elevations in negative affect (e.g., shame, anxiety, sadness), rejection, criticism, and general life stress predict higher NSSI engagement (e.g., Liu et al., 2014; Miller et al., 2019; Muehlenkamp et al., 2009; Victor et al., 2019), further substantiating the importance of examining how risk factors of NSSI vary over time within an individual's life. Moreover, this

finding holds implications for refining behavioural models of NSSI, which thus far have not specified whether experiencing more desirable consequences *relative to other people* (i.e., between-person) or *relative to one's own average* (i.e., within-person) more strongly predicts NSSI severity. While more research is needed to ascertain whether the findings of this study hold in other samples, researchers may wish to consider whether behavioural models of NSSI should be modified to overtly emphasize and use language that conveys the role of within-person desirable NSSI consequences in maintaining the behaviour.

Clinical Implications

Given that NSSI is a clinically significant behaviour, it is important to consider how this study might inform interventions for individuals who self-injure. Presently, many treatments for NSSI draw on the principle of operant conditioning to reduce NSSI frequency, for instance, by conducting individualized functional assessments of the antecedents and consequences of NSSI and using this information to replace NSSI with more adaptive behaviours (see Turner et al., 2014, for a review). The *treatment for self-injurious behaviours* (T-SIB) is one behavioural intervention that identifies the functions of NSSI and then implements differential reinforcement procedures to decrease NSSI and increase adaptive behaviours that fulfill the same function (Andover et al., 2017). The efficacy of the T-SIB in reducing NSSI is promising, as a randomized controlled pilot study found that it led to larger decreases in NSSI frequency over the course of treatment, relative to treatment as usual (Andover et al., 2017). To my knowledge, however, no behavioural interventions specifically monitor the versatility of NSSI. The findings of this study, combined with previous research showing that NSSI versatility is a salient marker of clinical severity (Anestis et al., 2015; Klonsky, & Olino, 2008; Robertson et al., 2013; Saraff & Pepper, 2014; Turner et al., 2013; Victor & Klonsky, 2014), suggest that clinicians should attend to how many

times and how many ways a client self-injures. Assessing and monitoring NSSI versatility on an ongoing basis may help clinicians identify people who are experiencing especially reinforcing episodes of NSSI and guide decisions surrounding treatment needs.

The finding that desirable emotional consequences of NSSI predicted a rise in NSSI versatility aligns with research showing that many people who self-injure overlook the long-term negative impacts of NSSI (e.g., scarring, shame, strained relationships) in favour of its short-term emotional benefits (e.g., Tan et al., 2019; Wadman et al., 2017). Thus, clinicians working with people who self-injure may wish to explore the utility of implementing *motivational interviewing*, a directive, client-centered counseling style that promotes behaviour change by helping clients resolve ambivalence (Rollnick & Miller, 1995). Most individuals who seek treatment are not entirely ready to stop engaging in NSSI, and due to vacillating readiness and motivation, many people who attempt to modify behaviours are not initially successful in maintaining gains (Kress & Hoffman, 2008; Prochaska et al., 1992). Accordingly, it may be beneficial for clinicians to adopt a balanced approach by acknowledging the immediate benefits of NSSI while also highlighting the potential disadvantages of the status quo. By accentuating this discrepancy, clients may begin to connect their NSSI with its long-term negative consequences and consider these consequences before they self-injure. Although motivational interviewing has been implemented with people who self-injure (Kress & Hoffman, 2008), more research is needed to ascertain the utility of incorporating these techniques into evidence-based treatments for NSSI.

The finding that desirable social consequences of NSSI were deterring, rather than reinforcing, may also have ramifications for clinical practice. *Dialectical behaviour therapy* (DBT) is a popular multi-component cognitive-behavioural treatment that aims to reduce NSSI and suicide attempts by enhancing skills related to emotion regulation, distress tolerance, and building

a life worth living (Linehan, 1993). Importantly, DBT enforces a “24-hour rule” wherein clients cannot communicate with their therapist outside of scheduled sessions for 24 hours after an NSSI episode, on the rationale that therapist contact following NSSI may reinforce the behaviour (see Ben-Porath, 2015, for a review). Given the limited number of prospective studies examining the relation between desirable social consequences and NSSI severity, however, this seems to be an area where researchers have jumped from theory to application without sufficient testing. In fact, the results of this study leave open the possibility that having social contact following NSSI may be conducive to reducing NSSI. While the current results cannot be generalized to contact with mental health professionals, it may be beneficial for clinicians to test potential reinforcement patterns with each individual client rather than assume that social contact will reinforce NSSI.

In a similar vein, the link between desirable social consequences of NSSI and decreased NSSI frequency points to the potential importance of inviting close others (e.g., family, romantic partners, friends) to partake in interventions for NSSI. Specifically, clinicians could provide psychoeducation surrounding the functions and common misconceptions of NSSI, as well as offer in-session coaching on conflict resolution, provision of support, and strategies for responding to NSSI. Indeed, DBT protocols that incorporate a family-based component for treating NSSI in youth show promise as a beneficial avenue for clinical practice. Notably, a recent randomized clinical trial of a DBT intervention including multi-family group skills training, youth and parent telephone contact, one-on-one individual sessions with parents, and joint family sessions, found that it led to significantly larger reductions in NSSI and suicide attempts relative to individual and group supportive therapy (McCauley et al., 2018). This underscores the potential efficacy of integrating family members into treatments for NSSI; as such, future research should explore

whether similar benefits emerge for adults who self-injure or when other close individuals, such as friends or romantic partners, are included in therapy.

Finally, the significant association between within-person fluctuations in desirable NSSI consequences and NSSI severity may have implications for the assessment and treatment of NSSI. As previously alluded to, while between-person risk factors elucidate *who* should be targeted with a given intervention, within-person risk factors illuminate *when* interventions should be delivered or augmented. Given that most research has focused on identifying between-person risk factors of NSSI, clinicians typically know very little about when an individual's risk for NSSI is greatest and when stronger or more intensive interventions are required. Therefore, to improve the quality of mental health care for individuals struggling with NSSI, it is imperative to identify markers that signal upcoming escalations in NSSI risk. The results from this study contribute to this critical area of research by identifying within-person increases in desirable emotional consequences of NSSI as a precursor to rises in NSSI versatility, and thus underscore the potential utility of ongoing and repeated assessment of individual fluctuations in these consequences. This kind of personalized approach could indicate the need for increased monitoring during particularly high-risk periods. Moreover, these results highlight the potential value of helping clients strategically apply therapeutic tools (e.g., flexible emotion regulation strategies, distress tolerance) during periods of elevated NSSI risk, namely when they are experiencing episodes of NSSI that are particularly emotionally rewarding, to curtail the increases in NSSI versatility that may follow.

Limitations

This study had several strengths, including its strong theoretical rationale, longitudinal design, and application of advanced statistical techniques to disentangle between- and within-person variation in desirable NSSI consequences. Nevertheless, there are important limitations that

should be addressed in future research. First, and perhaps most importantly, this study relied on self-report questionnaires to measure desirable NSSI consequences. Unfortunately, this method suffers from retrospective recall bias, especially given that participants were asked to provide an aggregated report of NSSI consequences over a three-month period. This is problematic because participants may have defaulted to cognitive scripts of a “typical” NSSI episode rather than accurately recalled the details of each specific NSSI episode when asked to aggregate across multiple episodes of the behaviour (Schacter, 1999). Furthermore, the demand characteristics inherent to overtly asking participants to report on the consequences of NSSI may have encouraged socially desirable responses (Klonsky, 2007), particularly for social consequences that are often perceived as indicators that a person is being manipulative, attention-seeking, or disingenuous in their NSSI (Klonsky, 2007; Nock, 2008). Despite these limitations, examining how participants recall the consequences of NSSI is valuable; if an individual recalls experiencing reductions in negative affect when they self-injure, then they may be more likely to repeat NSSI when they feel similar emotions in the future, even if the details recalled about the original event are inaccurate.

Additional measurement-related limitations of this study include how NSSI frequency and versatility were measured, as well as the subscales of desirable NSSI consequences that were derived from the EFA. First, NSSI frequency was measured on an ordinal scale. Although measuring the average frequency of NSSI over the past three months is more informative than dichotomously assessing NSSI engagement, asking for an exact count of NSSI episodes may have yielded more nuanced information, particularly at the high end of NSSI frequencies. Second, the timeframe over which NSSI versatility was measured changed from the baseline to follow-up assessments, such that participants were asked to report on the number of NSSI methods they used in their lifetime at baseline and the number of NSSI methods they used over the past three months

at the follow-ups. The non-comparability of timeframes made it impossible to ascertain how many NSSI methods were used in the three months prior to the baseline assessment; nevertheless, z-scoring the NSSI versatility variable prior entry into the HLM provided the best possible estimate of participants' relative standing on NSSI versatility. Third, the SASII did not assess undesirable NSSI consequences. This is unfortunate because the principle of operant conditioning proposes that both the timing and net valence of desirable and undesirable consequences influences the intensity/strength of a behaviour (Skinner, 1938, 1953). Consequently, this study likely overlooked salient deterrents of NSSI. Finally, low communalities and factor loadings in the EFA led to the retention of only four items assessing desirable social consequences of NSSI, which restricted the comprehensiveness of the social consequences that were examined and the internal consistency of the subscale. In particular, one salient desirable social consequence of NSSI that was not reflected in this study was social support, which has been recognized as a potential reinforcer of NSSI (Turner et al., 2016). Given that several consequences that may reinforce or deter NSSI were omitted in this study, the results may have limited generalizability.

A final limitation of this study was that the sample was comprised almost exclusively of females. Although the odds of engaging in NSSI are higher for females than males, the effect size is small and the overall prevalence of NSSI in men is still remarkably high (see Bresin & Schoenleber, 2015, for a meta-analytic review). Moreover, there appears to be important gender differences with respect to NSSI characteristics; for example, whereas women are more likely to engage in methods of NSSI that typically involve blood (e.g., cutting, scratching), men are more likely to punch themselves, burn themselves, or bang their heads (Andover et al., 2010; Sornberger et al., 2012; Whitlock et al., 2006). There is also emerging evidence that women are more likely to endorse emotion regulation motives for NSSI (e.g., "*I felt very unhappy or depressed*", "*To*

avoid painful memories”), whereas men are more likely to endorse social motives for NSSI (e.g., *“It helped me join a group”*, *“To show others how tough I am”*; Claes et al., 2007; Laye-Gindhu and Schonert-Reichl, 2005). In the context of this study, therefore, it is possible that the desirable social consequences of NSSI were underreported given the predominately female sample and that significant gender differences with respect to NSSI versatility were overlooked. As such, caution is warranted before generalizing these results to males who engage in NSSI.

Future Directions

Notwithstanding its limitations, this study illuminates several directions for future research that can advance the field. Notably, future studies should combine EMA and longitudinal methods to investigate how the consequences that immediately follow NSSI relate to long-term patterns of NSSI engagement. For instance, EMA could be used to collect reports of participants’ emotions and social interactions as they go about their daily lives; from these reports, researchers could infer the consequences of NSSI by computing change scores from pre- to post-NSSI engagement. In this way, not only does EMA substantially alleviate retrospective recall bias, but it reduces demand characteristics because participants are not asked to label potential causes or consequences of a socially-unacceptable behaviour (Klonsky, 2007). Subsequently, the extent to which individuals experienced desirable consequences following NSSI during the EMA period could be used to predict the trajectory of NSSI frequency and versatility over a longitudinal follow-up (e.g., one year), thereby capitalizing on the strengths of both EMA and longitudinal methods.

Another future direction that can overcome the limitations of self-report measures is to use objective, lab-based tasks to examine the longitudinal association between the consequences and severity of NSSI. For instance, tasks that measure implicit cognitions, such as dot-probe tasks, lexical decision tasks, stroop tests, and implicit association tests (IATs), may circumvent self-

report biases and enable researchers to more accurately examine the expected consequences of NSSI (i.e., how strongly a person expects to experience reductions in negative affect or increases in interpersonal closeness following NSSI-related stimuli). In fact, some research has already moved in this direction; Gratz et al. (2016) found that the association between NSSI and emotion relief measured by an IAT predicted higher NSSI frequency and versatility six months later. Moreover, the NSSI-relief association predicted subsequent NSSI versatility above and beyond self-reported emotion relief motives for NSSI, underscoring its incremental validity (Gratz et al., 2016). To my knowledge, however, no studies have used IATs to examine the social consequences of NSSI, which are arguably where this methodology would be most valuable given that people are reluctant to overtly endorse these consequences (Heath et al., 2009; Klonsky, 2007; Nock, 2008). In sum, finding novel methods to bolster research on the social consequences of NSSI will facilitate a more complete understanding of the contingencies that maintain NSSI.

Future research should also identify psychosocial factors that exacerbate or attenuate the association between desirable NSSI consequences and NSSI severity. In other words, what are the establishing operations that lead some episodes of NSSI to be highly rewarding and what are the abolishing operations that lead other episodes of NSSI to be less rewarding? Considering evidence that emotional distress increases people's propensity to engage in maladaptive coping strategies to feel better immediately, regardless of the long-term negative consequences (Tice et al., 2001), it is possible that the association between desirable emotional consequences of NSSI and NSSI versatility is stronger under conditions of heightened emotional distress. Another potential establishing operation could be having a high degree of congruence between motives for and consequences of NSSI. Put another way, it may not be the absolute value of desirable NSSI consequences that a person experiences, but the degree to which the motives and consequences

match, that is most predictive of future NSSI (Saraff et al., 2015). Conversely, it is plausible that NSSI is experienced as less rewarding under opposite conditions, such as when emotional distress is lower than usual, or when there is a low degree of congruence between motives for and consequences of NSSI. Identifying the motivating operations of NSSI has clear clinical implications, as mental health professionals could attempt to reduce the reinforcing properties of NSSI by decreasing its establishing operations and increasing its abolishing operations.

Finally, it is important to enhance our understanding of the processes that underlie desistance and recovery from NSSI. Based on the principle of operant conditioning, experiencing undesirable consequences following NSSI should be a key mechanism that reduces the intensity/strength of the behaviour. As such, it is possible that experiencing negative affect or adverse reactions from others after NSSI explains why some individuals engage in the behaviour only once or a few times (Andrews et al., 2013; Bracken-Minor et al., 2012; Hamza & Willoughby, 2013; Klonsky & Olino, 2008). Unfortunately, although a few studies have shown that a subset of individuals feel worse after NSSI (Kakhnovets et al., 2010; Power et al., 2015), it remains unknown whether this diminishes the frequency and versatility with which the behaviour is repeated. Research that addresses this hypothesis would provide a more comprehensive test of the applicability of operant conditioning to explaining divergent patterns of NSSI engagement.

Conclusions

This study represents an important step forward in testing behavioural models of NSSI. First, this study suggests that desirable emotional and social consequences of NSSI exert opposing influences on NSSI severity. Whereas experiencing improved affect following NSSI seems to reinforce the behaviour by predicting a rise in NSSI versatility, fulfilling unmet interpersonal needs following NSSI appears to deter the behaviour by predicting a decline in NSSI frequency. Future

research that identifies mediators and moderators of the associations between desirable NSSI consequences and subsequent NSSI engagement will help clarify these findings. Second, this study highlights the salience of within-person fluctuations in desirable NSSI consequences in predicting future NSSI severity. Most notably, within-person increases in desirable emotional consequences of NSSI seem to portend periods of elevated NSSI versatility, supporting the clinical utility of monitoring these consequences to identify *when* interventions should be delivered or augmented to curtail NSSI risk. Finally, this study substantiates the need to consider not only how many times but how many ways a person self-injures. Specifically, the positive association between desirable emotional consequences of NSSI and NSSI versatility underscores the importance of assessing the number of methods that a person uses to self-injure in interventions and including this construct in behavioural models of NSSI. By enhancing our understanding of why some individuals persistently self-injure, this study provides a springboard for refining behavioural models of NSSI, advancing longitudinal research on the contingencies that maintain self-injury, and ameliorating intervention efforts that draw on the principle of operant conditioning to reduce NSSI.

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Appendix A

Suicide Attempt Self-Injury Interview (SASII)

*Did any of the things on the following list happen to you immediately following your self-injury?
Please give a rating on a scale of 1 to 5*

1 = "Not true/did not happen at all" to 5 = "Very true/happened a lot"

Bad feelings stopped	<input type="text"/>
Others understood how desperate you are/were	<input type="text"/>
You got help	<input type="text"/>
You gained admission to a hospital or treatment program	<input type="text"/>
You felt something, even if it was pain	<input type="text"/>
You felt punished or succeeded in punishing yourself	<input type="text"/>
You got a vacation from having to try so hard	<input type="text"/>
You got out of doing something	<input type="text"/>
You shocked or impressed others	<input type="text"/>
You proved to yourself that things really were bad	<input type="text"/>
It gave you something, anything, to do	<input type="text"/>
Other people treated you better	<input type="text"/>
You got back at or hurt someone	<input type="text"/>
Other people were better off than before you harmed yourself	<input type="text"/>
You got away or escaped	<input type="text"/>
You stopped feeling numb or dead	<input type="text"/>
You prevented yourself from being hurt in a worse way	<input type="text"/>
Feelings of anger, frustration, or rage stopped	<input type="text"/>
Others realized how wrong they are/were	<input type="text"/>
Feelings of anxiety or terror stopped	<input type="text"/>
You were distracted from other problems	<input type="text"/>
Feelings of aloneness, emptiness, or isolation stopped	<input type="text"/>
Feelings of self-hatred or shame stopped	<input type="text"/>
Your (self-injury/suicide attempt/overdose) expressed your anger or frustration	<input type="text"/>
You experienced relief from a terrible state of mind	<input type="text"/>
Feelings of sadness stopped	<input type="text"/>
You stopped feeling empty inside, as if you were unreal, or disconnected from your feelings	<input type="text"/>
Feelings of depression stopped	<input type="text"/>
You felt worse about yourself or felt more self-hatred/shame.	<input type="text"/>
Other (please specify)	<input type="text"/>

Appendix B

Items from the Questionnaire for Nonsuicidal Self-Injury (QNSSI)

This questionnaire consists of a number of questions regarding self-harming behaviour. Based on this questionnaire, we want to examine self-harming behaviour more closely and are interested in finding out how often you harm yourself, how you harm yourself, if you experience pain while you do, what your expectations and sensations are during self-harm, as well as the environmental triggers and consequences of your self-harm behaviour.

How often have you hurt yourself on average over your lifetime? [asked at baseline]

- I haven't hurt myself in my lifetime
- Once a month or less often
- 2-3 times a month
- 1-2 times a week
- 3-6 times a week
- Daily or more than once a day

How often have you hurt yourself on average in the past three months? [asked at baseline and each follow-up]

- I haven't hurt myself in the past three months
- Once a month or less often
- 2-3 times a month
- 1-2 times a week
- 3-6 times a week
- Daily or more than once a day

Appendix C

Deliberate Self-Harm Inventory (DSHI)

This questionnaire asks about a number of different things that people sometimes do to hurt themselves. Please be sure to read each question carefully and respond honestly. Often, people who do these kinds of things to themselves keep it a secret, for a variety of reasons. However, honest responses to these questions will provide us with greater understanding and knowledge about these behaviors and the best way to help people. Please answer yes to a question only if you did the behavior intentionally, or on purpose, to hurt yourself. Do not respond yes if you did something accidentally (e.g., you tripped and banged your head on accident). Also, please be assured that your responses are completely confidential.

Have you ever intentionally (i.e., on purpose)...[asked at baseline]

In the past three months, have you intentionally (i.e., on purpose)...[asked at each follow-up]

1. Cut your wrist, arms, or other area(s) of your body (without intending to kill yourself)?

- Yes
- No

If yes...

How old were you when you first did this?

How many times have you done this?

When was the last time you did this?

How many years have you been doing this? (If you are no longer doing this, how many years did you do this before you stopped?)

Has this behavior ever resulted in hospitalization or injury severe enough to require medical treatment? Yes No

2. Burned yourself with a cigarette?

- Yes
- No

If yes...

How old were you when you first did this?

How many times have you done this?

When was the last time you did this?

How many years have you been doing this? (If you are no longer doing this, how many years did you do this before you stopped?)

Has this behavior ever resulted in hospitalization or injury severe enough to require medical treatment? Yes No

3. Burned yourself with a lighter or a match?

- Yes
- No

If yes...

How old were you when you first did this?

How many times have you done this?

When was the last time you did this?

How many years have you been doing this? (If you are no longer doing this, how many years did you do this before you stopped?)

Has this behavior ever resulted in hospitalization or injury severe enough to require medical treatment? Yes No

4. Carved words into your skin?

Yes

No

If yes...

How old were you when you first did this?

How many times have you done this?

When was the last time you did this?

How many years have you been doing this? (If you are no longer doing this, how many years did you do this before you stopped?)

Has this behavior ever resulted in hospitalization or injury severe enough to require medical treatment? Yes No

5. Carved pictures, designs, or other marks into your skin?

Yes

No

If yes...

How old were you when you first did this?

How many times have you done this?

When was the last time you did this?

How many years have you been doing this? (If you are no longer doing this, how many years did you do this before you stopped?)

Has this behavior ever resulted in hospitalization or injury severe enough to require medical treatment? Yes No

6. Severely scratched yourself, to the extent that scarring or bleeding occurred?

Yes

No

If yes...

How old were you when you first did this?

How many times have you done this?

When was the last time you did this?

How many years have you been doing this? (If you are no longer doing this, how many years did you do this before you stopped?)

Has this behavior ever resulted in hospitalization or injury severe enough to require medical treatment? Yes No

7. Bit yourself, to the extent that you broke the skin?

Yes

No

If yes...

How old were you when you first did this?

How many times have you done this?

When was the last time you did this?

How many years have you been doing this? (If you are no longer doing this, how many years did you do this before you stopped?)

Has this behavior ever resulted in hospitalization or injury severe enough to require medical treatment? Yes No

8. Rubbed sandpaper on your body?

Yes

No

If yes...

How old were you when you first did this?

How many times have you done this?

When was the last time you did this?

How many years have you been doing this? (If you are no longer doing this, how many years did you do this before you stopped?)

Has this behavior ever resulted in hospitalization or injury severe enough to require medical treatment? Yes No

9. Dripped acid onto your skin?

Yes

No

If yes...

How old were you when you first did this?

How many times have you done this?

When was the last time you did this?

How many years have you been doing this? (If you are no longer doing this, how many

years did you do this before you stopped?)

Has this behavior ever resulted in hospitalization or injury severe enough to require medical treatment? Yes No

10. Used bleach, comet, or oven cleaner to scrub your skin?

- Yes
- No

If yes...

How old were you when you first did this?

How many times have you done this?

When was the last time you did this?

How many years have you been doing this? (If you are no longer doing this, how many years did you do this before you stopped?)

Has this behavior ever resulted in hospitalization or injury severe enough to require medical treatment? Yes No

11. Stuck sharp objects (e.g., needles, pins, staples, etc.) into your skin, not including tattoos, ear piercing, needles used for drug use, or body piercing?

- Yes
- No

If yes...

How old were you when you first did this?

How many times have you done this?

When was the last time you did this?

How many years have you been doing this? (If you are no longer doing this, how many years did you do this before you stopped?)

Has this behavior ever resulted in hospitalization or injury severe enough to require medical treatment? Yes No

12. Rubbed glass into your skin?

- Yes
- No

If yes...

How old were you when you first did this?

How many times have you done this?

When was the last time you did this?

How many years have you been doing this? (If you are no longer doing this, how many years did you do this before you stopped?)

Has this behavior ever resulted in hospitalization or injury severe enough to require medical treatment? Yes No

13. Broken your own bones?

- Yes
- No

If yes...

How old were you when you first did this?

How many times have you done this?

When was the last time you did this?

How many years have you been doing this? (If you are no longer doing this, how many years did you do this before you stopped?)

Has this behavior ever resulted in hospitalization or injury severe enough to require medical treatment? Yes No

14. Banged your head against something, to the extent that you caused a bruise to appear?

- Yes
- No

If yes...

How old were you when you first did this?

How many times have you done this?

When was the last time you did this?

How many years have you been doing this? (If you are no longer doing this, how many years did you do this before you stopped?)

Has this behavior ever resulted in hospitalization or injury severe enough to require medical treatment? Yes No

15. Punched yourself, to the extent that you caused a bruise to appear?

- Yes
- No

If yes...

How old were you when you first did this?

How many times have you done this?

When was the last time you did this?

How many years have you been doing this? (If you are no longer doing this, how many years did you do this before you stopped?)

Has this behavior ever resulted in hospitalization or injury severe enough to require medical treatment? Yes No

16. Prevented wounds from healing?

- Yes
- No

If yes, how old were you when you first did this?

How many times have you done this?

When was the last time you did this?

How many years have you been doing this? (If you are no longer doing this, how many years did you do this before you stopped?)

Has this behavior ever resulted in hospitalization or injury severe enough to require medical treatment?

17. Done anything else to hurt yourself that was not asked about in this questionnaire?

Yes

No

If yes...

If yes, what did you do to hurt yourself?

How old were you when you first did this?

How many times have you done this?

When was the last time you did this?

How many years have you been doing this? (If you are no longer doing this, how many years did you do this before you stopped?)

Has this behavior ever resulted in hospitalization or injury severe enough to require medical treatment? Yes No